

*CHRYSOPETALUM, BHAWANIA AND TWO NEW  
GENERA OF CHRYSOPETALIDAE (POLYCHAETA),  
PRINCIPALLY FROM FLORIDA*

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*Abstract.*—The Chrysopetalidae are compared with other families in the order Phyllodocida. *Treptopale*, n. gen., and *Hyalopale*, n. gen., are proposed. *Chrysopetalum hernancortezae*, *C. heteropalea*, *C. floridanum*, *C. eurypalea*, *Treptopale rudolphi*, and *Hyalopale bispinosa*, all new species, are described from Florida. *Chrysopetalum remanei*, n. sp., is described from the Red Sea. *Chrysopetalum debile* (Grube), *C. occidentale* Johnson, *C. elegans* Bush, *Bhawania goodei* Webster, and *B. heteroseta* (Hartman), n. comb., from various areas are additionally described. The status of *Chrysopetalum elongatum* (Grube) from the Virgin Islands is discussed. Important characters of the above genera plus *Paleanotus* Schmarida, *Dysponetus* Levinsen, and three unnamed generic groups are discussed. A generic key and keys to Floridan species of *Chrysopetalum* and *Bhawania* are provided.

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This report is based on examination of available specimens of Chrysopetalidae from several important collections from Florida, as well as miscellaneous specimens from Bermuda, California, the Mediterranean Sea, and the Red Sea. A species of *Paleanotus* and single species of two undescribed genera from Florida cannot be included in this report, but it is anticipated that at least one of these will be described soon (Charlotte Watson Russell, in litt.).

Types and other material for study are deposited in the Allan Hancock Foundation, University of Southern California (AHF); British Museum (Natural History) (BMNH); California Academy of Sciences (CAS); Invertebrate Collection of the Florida Department of Natural Resources, Bureau of Marine Research (FSBC I); Indian River Coastal Zone Museum, Harbor Branch Foundation, Inc., Fort Pierce, Florida (IRCZM); Marine Environmental Sciences Consortium, Dauphin Island, Alabama (MESC); National Museum of Natural History, Smithsonian Institution (USNM); Peabody Museum of Natural History, Yale University (YPM); Universitetets Zoologiske Museum, Copenhagen (ZMC); and Zoologisches Institut und Zoologisches Museum, Hamburg University (ZMH).

Included are specimens collected from September 1971 to July 1973 in an environmental baseline study of marine biota near the Florida Power and Light Company nuclear power plant at Hutchinson Island, St. Lucie County, Florida, funded in part by Florida Power and Light Company. The study area and methods were described by Gallagher and Hollinger (1977). Sediments were described by Gallagher (1977). Other aspects of the physical and chemical environment were reported by Worth and Hollinger (1977). This area has been the subject of several faunal reports including five on the Polychaeta (see Perkins 1984).

Chrysopetalids of the Hourglass Cruises were obtained by the Florida Department of Natural Resources at ten stations on two transects in the eastern Gulf of

Mexico sampled monthly from August 1965 to November 1967. The rationale and pertinent data for these collections were reported by Joyce and Williams (1969). Many groups from these collections have been described in the *Memoirs of the Hourglass Cruises* published by the Florida Department of Natural Resources, Bureau of Marine Research.

Chrysopetalids associated with the coral *Oculina varicosa* (Lesueur) collected off southeastern Florida by Harbor Branch Foundation in depths from about 3 to 80 m during 1975–1979 using *Johnson-Sea-Link* (J-S-L) submersibles I and II and SCUBA were provided by John K. Reed. Reed (1980) reported on the distribution and structure of deep-water reefs of that study, and Reed et al. (1982) provided additional information.

Chrysopetalids collected from over 400 estuarine benthic stations in Tampa Bay during June 1963–August 1964 by John L. Taylor and Carl H. Saloman of the U.S. National Marine Fisheries Service were studied. Polychaetes of that study were reported by Taylor (1971) and Hall and Saloman (1975), and examples of most species were deposited in the USNM by Taylor.

Collections of chrysopetalids made during October 1981–September 1983 as part of the Biscayne Bay Restoration and Enhancement Program, Dade County, Florida, were funded by the Florida Department of Environmental Regulation (DER) and administered by the Dade County Department of Environmental Resource Management (DERM). More than 350 species of tropical estuarine polychaetes were identified from 180 collections (Richard Walesky, in litt.). Permission to use the specimens was granted by Edward A. Swakon and Gary R. Milano, both of Dade County. Patsy A. McLaughlin of Florida International University and Peter Schroeder of Biosystems Research, Inc., Miami, Florida, provided additional information. Specimens were tentatively identified by Harvey D. Rudolph (DER), who also provided specimens from his personal collections associated with reefs of *Phragmatopoma lapidosa* Kinberg and miscellaneous other specimens.

Chrysopetalids from Looe Key National Marine Sanctuary, Monroe County, Florida, 24°32'N, 81°24'W, an offshore bank coral reef, were provided by Kristian Fauchald (USNM). Specimens were collected during 25–29 Sep 1982 by K. Fauchald, B. Kensley, and M. Schotte under Contract No. NA82AAA00962, Sanctuary Program, Office of Ocean and Coastal Resource Management, U.S. Department of Commerce, to the Smithsonian Institution. Fauchald also loaned miscellaneous specimens. R. J. Helbling (DER), Norman J. Blake, University of South Florida, and Thomas Hopkins (MESC) also provided specimens.

Voucher specimens of chrysopetalids from the Gulf of Mexico reported by Gathof (1984) were examined. Specimens were collected for the U.S. Bureau of Land Management, now Minerals Management Service, during the Mississippi, Alabama, Florida Study (MAFLA), South Florida Study (SOFLA), South Texas Outer Continental Shelf Study (STOCS) and Ixtoc Oil Spill Assessment Study (IXTOX). Voucher specimens are deposited in the National Museum of Natural History (USNM). Other MAFLA specimens were also examined.

The type of *Chrysopetalum elegans* Bush from Bermuda was loaned by Willard Hartman (YPM). Specimens of *Chrysopetalum debile*, the new *Chrysopetalum* from the Red Sea, and comparative material of *Paleanotus chrysolepis* Schmarnda were loaned by Gesa Hartmann-Schröder (ZMH). Susan J. Williams (AHF) loaned

specimens of *Chrysopetalum occidentale*. Barbara Weitbrecht (CAS) loaned comparative material of *Paleanotus bellis* (Johnson). Marian H. Pettibone (USNM) and Mary Petersen (ZMC) provided copies of papers not available to me. Mary Petersen also provided information on the specimen in the Copenhagen Museum examined by Augener (1925) and discussed herein under the name *Chrysopetalum elongatum* Grube. William G. Lyons critically read the manuscript, and it was thoroughly reviewed by Marian H. Pettibone.

#### Abbreviations on Figures

ca	caruncle	pl	paleae, lateral group
cd	cirrophore of dorsal cirrus	pm	paleae, middle group
dl	dorsal lamella (covering prostomium)	pml	paleae, midline group
gl	gland	roman numeral	segment number
la	lateral antenna	s	spine
ma	median antenna	segment no. + d	dorsal ramus (or cirrus)
mc	mouth cover	segment no. + dc	dorsal cirrus
mo	mouth opening	segment no. + v	ventral ramus (or cirrus)
P	palp	segment no. + vc	ventral cirrus
pa	paleae, anterior		

Under his group Aphroditea, Savigny (1820:16) described *Palmyra aurifera*. Audouin and Milne Edwards (1832:445, 446, pl. 10, figs. 1–6) supplemented the description, added figures and placed *P. aurifera* in the tribe Aphroditisiens Nus (where the body is lacking elytra). Kinberg (1858:1) established the family Palmyridae (as Palmyracea) for *P. aurifera* with the diagnosis: elytra lacking; paleae on all segments; tubercles and dorsal cirri alternating.

Schmarda (1861:162) included *Palmyra* Savigny and two new genera, *Paleanotus* and *Bhawania*, in the family Palmyridae Kinberg, 1858. This arrangement has been followed by Day (1967:115) and others.

Ehlers (1864:115) established the family Chrysopetalidae (as Chrysopetalea) for the new genus *Chrysopetalum*, the two genera of Schmarda, and questionably *Palmyra* Savigny.

The following authorities have indicated that *Palmyra* should not be linked with Chrysopetalidae and that it is closely allied with Aphroditidae Kinberg, 1856, only lacking elytra: Racovitza (1896:209, 216–217), Augener (1913:80–83), and Horst (1917:136).

In her catalogue, Hartman (1959:125–127) included Palmyridae Kinberg, 1858, and Chrysopetalidae Ehlers, 1864, as separate families. In more recent classifications of the Polychaeta, Mileikovsky (1977:515) placed both families under the order Phyllocemomorpha; Fauchald (1977a:8) placed them both under the order Phyllococida: suborder Aphroditiformia: superfamily Chrysopetalacea; and Pettibone (1982:5) placed Chrysopetalidae as an aberrant family in the order Phyllococida. In her revisionary studies in progress, Pettibone (in litt.) is including *Palmyra*, along with some other genera, in a subfamily of Aphroditidae, showing its close relationship to the elytrigerous Aphroditidae and not to the Chrysopetalidae.

However, the position of Chrysopetalidae in the order Phyllococida has not been clarified. Among other families of the Phyllococida, chrysopetalids share the character of internally chambered setae with Nereididae (shafts of compound



setae), Nephtyidae (preacicular “laddered” capillaries), most Hesionidae (shafts of compound setae, notosetae, acicula of some), some Aphroditidae (paleate setae; see *Pontogenia chrysocoma*. — Claparède, 1868:368–371, pl. 1, fig. 3), and some Sigalionidae (blades of compound setae; see *Sthenelais simplex* Ehlers, 1887:60–63, pl. 13, figs. 2, 3, pl. 4, figs. 1–6). Chrysopetalids share the character of paleate setae, which may not be internally chambered, with other Aphroditidae (*Palmyra aurifera*). However, relationships among families indicated by internally chambered setae and paleae may not be close but very old, extending back to the Middle Cambrian *Canadia* Wolcott: Canadiidae (see Conway Morris 1979:240–251).

Among families of the order Phyllodocida, chrysopetalids share the character of a single pair of bilateral jaws with Nereididae, Nephtyidae and some Hesionidae; they share a very similar muscular attachment of the jaws with Nereididae; they have simple notosetae and compound neurosetae and the same number of antennae and palps as some Hesionidae. Finally, some chrysopetalids (e.g., *Chrysopetalum caecum* Langerhans) have acicula in cirrophores of segment 1 as do some Hesionidae. However, cirri of segments 1 and 2 of the aberrant anterior end of chrysopetalids are only slightly modified, if not slightly reduced, and it is difficult to compare them with tentacular cirri of Hesionidae and Nereididae which are distinctly longer than dorsal cirri of following segments. I suspect that cirri of segments 1 and 2 of chrysopetalids have the same function as longer tentacular cirri of nereidids and hesionids, and they are here so defined, although, for brevity, they are not designated as such in the text. This suggests that Chrysopetalidae are related to Nereididae and Hesionidae (and perhaps Nephtyidae), although the relationships might not be especially close. However, they seem to be more closely related to these families than to other Phyllodocida.

It is also noted that the musculature of the pharynx of some Chrysopetalidae (e.g., *Dysponetus* and *Hyalopale*, n. gen.) resembles that of Syllidae; however, there are few other distinct similarities, suggesting that this character may have evolved separately in these families.

#### Chrysopetalidae Ehlers, 1864

##### Fig. 1

*Diagnosis.* — Body small to moderately large, usually slender, with segments less than 20 (*Dysponetus*) to more than 300 (*Bhawania*), 2–3 to 50 mm in length. Prostomium usually surrounded laterally or retractile within anterior segments, with 3 antennae, 2 palps, usually with 4 eyes, with or without bulbous caruncle. Parapodia biramous, rami well-developed, supported by acicula, with notosetae and neurosetae. Dorsal cirri on all segments; ventral cirri on all segments, absent on segment 2 or on segments 2 and 3. Notosetae beginning on segment 2, simple, including paleae and spines, only paleae, or only spines; usually directed posteriorly after first few segments, arranged in lateral bundles or long transverse groups, completely or incompletely covering dorsum. Neurosetae beginning on segment 2 or 3, compound or simple and compound. Notosetae and shafts of neurosetae internally chambered; chambers in paleae in rows forming 2 to many internal ribs, solitary in spines and in shafts of neurosetae except tips, latter usually with 2–3 ribs. Pygidium usually with anal cirri. Proboscis with anterior part cylindrical, posterior part strongly muscular, with bilateral, chitinous jaws or stylets.

*Remarks.* — Chrysopetalidae include the following four genera: *Chrysopetalum*



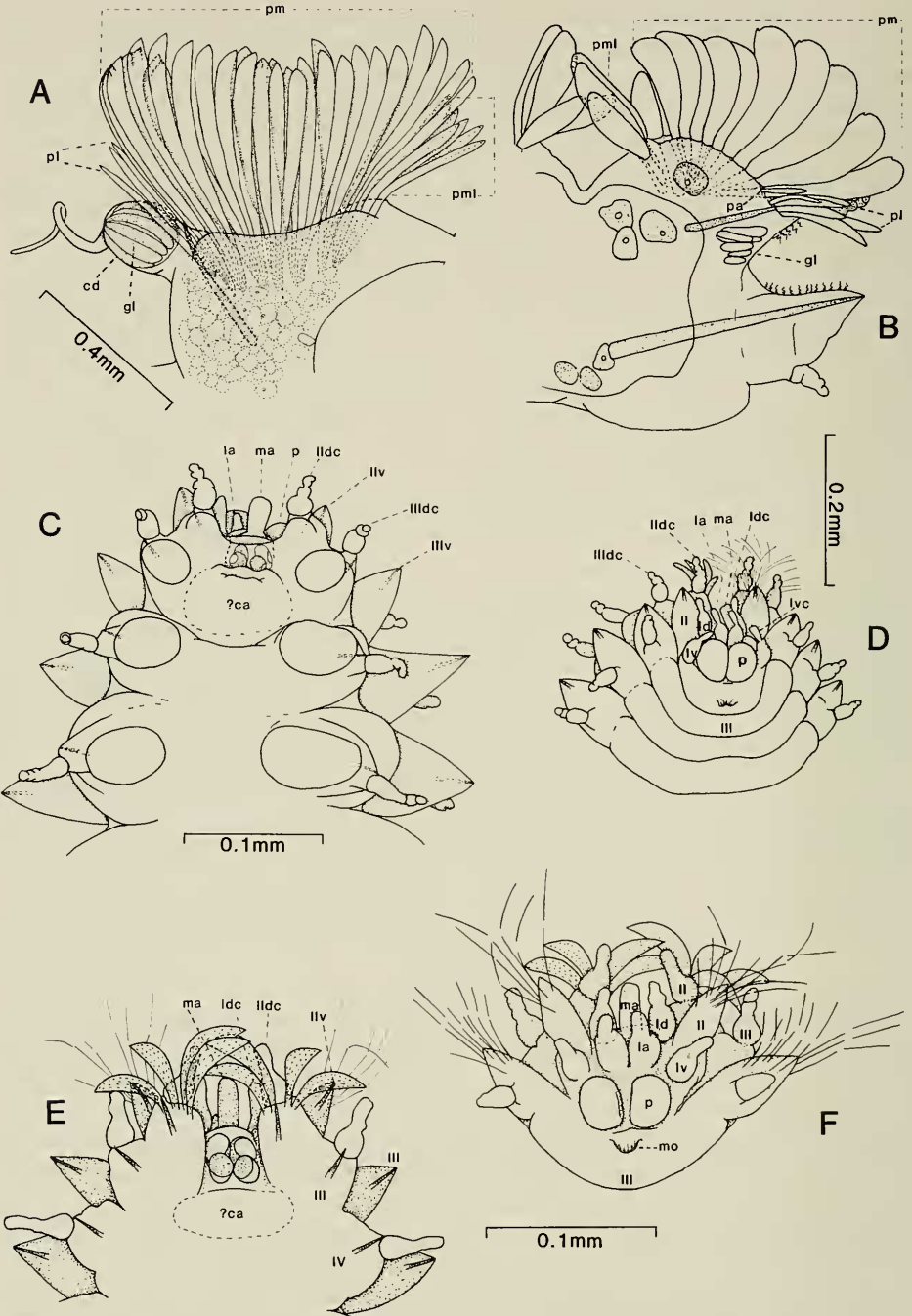


Fig. 1. *Chrysopetalum* sp., Biscayne Bay, Florida (FSBC I 31376); A, Left notopodium, middle segment, anterior view. *Paleanotus bellis*, Dillon Beach, California (CAS 9448): B, Right parapodium of middle fragment of large female, anterior view; C, Anterior end of small specimen, dorsal view; D, Anterior end of gravid female, ventral view. *Paleanotus* sp., NE Gulf of Mexico (FSBC I 23715): E, Anterior end of small specimen, dorsal view; F, Same, ventral view.

Ehlers, 1864; *Paleanotus* Schmarda, 1861 (*Heteropale* Johnson, 1897); *Bhawania* Schmarda, 1861; *Dysponetus* Levinsen, 1879 (*Taphus* Webster and Benedict, 1887). Two new genera, *Treptopale* and *Hyalopale*, are added here. Three additional genera are needed for: 1) species similar to *Chrysopetalum caecum* Langerhans, 1880; 2) species similar to *Bhawania reyesi* Katzmann, Laubier, and Ramos, 1974; and 3) *Paleanotus schmardai* Mileikovskiy, 1962. These are discussed and included in the key below.

Important generic characters include: retractility of the prostomium within anterior segments (Figs. 21A–C, 23A–D) and dorsal cirri within cirrophores of notopodia (Figs. 21E, 23F, G); position of the median antenna with respect to the eyes (Figs. 1C, 3A, 16A, 23A); presence of a bulbous caruncle (Fig. 3A) and a distinct lobe or appendage covering the mouth (Fig. 3B); arrangement of setae and dorsal and ventral cirri on the anterior two or three segments; presence of a distinct cirrophore of dorsal cirri (Fig. 11H); shape of the pygidium; number of segments; arrangement, type, and number of notosetae in various groups; and type, shape, and number of internal, chambered ribs in paleae, if present.

Notosetae may be produced in single groups of spines (*Dysponetus*) or various arrangements of spines and paleae in distinct lateral (preacicular; pl), middle (pm), midline (pml), and anterior groups (pa). Paleae of a middle group (pm) may be produced from a single developmental center resulting in a fan-shaped group (*Paleanotus*; Fig. 1B), from several such centers resulting in several, although indistinct, fans of setae (*Chrysopetalum*; Fig. 1A), or separately resulting in a broad, imbricate transverse row (*Bhawania*; Fig. 21E, 24A). Lateral paleae may be similar to paleae of the middle group or distinctly different. Midline group paleae, when present, have a characteristic shape in each genus, and may differ in thickness from those of the middle group. Anterior group notosetae number up to about six widely spaced slender paleae and spines on *Chrysopetalum*: there are single anterior paleae in notopodia of *Paleanotus* and *Treptopale*, n. gen.; they are absent in *Bhawania* and *Hyalopale*, n. gen.

*Chrysopetalum caecum* Langerhans (1880:278, 279, pl. 14, fig. 9a–c), redescribed by Laubier (1968:81, figs. 1, 2), was earlier referred to *Dysponetus* by Augener (1913:78, 79). It differs from typical *Dysponetus* in having antennae, palps, and dorsal cirri of different shapes, an appendage on the posterior rim of the mouth, and compound setae with bidentate blades and bifid shafts. This species belongs to an apparently undescribed genus which also includes *Dysponetus bidentatus* Day, 1954, an undescribed species from south Florida, and possibly *Dysponetus bulbosus* Hartmann-Schröder, 1982.

*Paleanotus schmardai* Mileikovskiy (1962:651, 652, fig. 2) appears similar to *Chrysopetalum* in some characters; it is certainly not a *Paleanotus*. It differs from *Chrysopetalum* in having dorsal cirri resembling those of *Paleanotus*, paleae of the middle group produced in two transverse rows from two developmental centers, and middle group paleae with symmetrical tips, the larger ones having about 40 internal, longitudinal ribs. The short paleae of the anterior row of the middle group (both figures of parapodia appear to be the usual posterior views) appear to be homologous with midline paleae of most other genera. Thus the generic status of *P. schmardai* is undefined.

The unidentified species reported as *Bhawania* by Jorge (1953:103) and later described as *Bhawania reyesi* by Katzmann, Laubier, and Ramos (1974) is not

a member of *Bhawania* Schmarida but is a species of a new genus being described by Charlotte Watson Russell (in litt.). This genus also includes a species from Florida waters (*Paleanotus* sp. A—Gathof, 1984:26-9, figs. 26-5, 26-6). Species of the genus have paleae of the middle group similar to those of *Bhawania*. However, they differ from *Bhawania* in having an anterior dorsum resembling that of *Paleanotus* Schmarida, except that a distinct caruncle is present, an anterior ventrum resembling that of *Chrysopetalum* Ehlers, paleae of the midline group which are very stout, paleae of the lateral group nearest the aciculum resembling those of the middle group but diminishing anteromedially, and notopodial cirri resembling those of *Paleanotus*.

The first segment of chrysopetalids is always considered to have two pairs of cirri. Observations by Katzmann, Laubier, and Ramos (1974) on *Bhawania reyesi* showed that the first pair of ventral cirri superficially associated with the second segment, were actually cirri of the first segment. This agrees with my observations on the similarity of cirri lateral to the palps and superficially associated with the second segment of some genera to ventral cirri of the first segment of *Chrysopetalum* species. There is no question as to which are ventral cirri of the first segment of *Chrysopetalum*, and they are similar in position and may be identical in shape to those of some other genera. Finally, examination of the undescribed species from Florida similar to *Chrysopetalum caecum* Langerhans and *Dysponetus bidentatus* Day, shows ventral cirri to be absent from segment 2: they are present on all segments of *C. caecum* but are stated to be absent from segments 2 and 3 of *D. bidentatus*. In this case, it appears that when ventral cirri are lost during cephalization, they are lost from segment 2 or segments 2 and 3, rather than from segment 1. However, this is not obvious for *Bhawania* (Figs. 21A-C, 23A-D) and some species of *Paleanotus* (Fig. 1C-F) and deserves further study.

Along with asetigerous segment 1, segment 2 has notosetae or both notosetae and neurosetae and is considered to be a tentacular segment. This is based on observations by Laubier (1968:80-83) on *Chrysopetalum debile* and *C. caecum* and on observations that, when ventral cirri are present on this segment, they are longer than those of following segments and similar to dorsal cirri. However, tentacular segments cannot be defined based on lengths of dorsal cirri: dorsal cirri of segments 1 and 2 are similar to those of following segments.

Because of retraction of the anterior end, or contraction during preservation, it is often difficult to determine the segment number of a dorsal or ventral ramus or cirrus of an anterior segment. This can usually be done by starting toward the middle of the body and counting forward.

Besides problems of determining homologies or correct segment numbers of various anterior cirri and parapodial parts, it is often difficult to observe the prostomium and anterior segments because they are usually obscured by paleae. Except where these are retracted (e.g., *Bhawania*), this can usually be done by very carefully spreading apart the paleae under a dissecting microscope or by observation under a compound microscope. Removal of paleae usually results in damage to these parts and should be done only when absolutely necessary or when specimens are available with which to practice.

Another aspect of observation which should be emphasized is that some parapodial characters, such as the surface detail of paleae and the arrangement of



paleae in the various groups, are best observed on a parapodium in anterior view. Most authors have published figures of parapodia and paleae in posterior view, and these characters often have not been noted. Dorsal cirri, ventral cirri, and some other parapodial characters are best observed in posterior view.

Key to Genera and "Unnamed Genera" of Chrysopetalidae

- 1. Notopodia of middle segments with paleae or paleae and spines . . . . . 3
- Notopodia of middle segments with only spines . . . . . 2
- 2. Compound neurosetae with unidentate blades; appendage absent on posterior rim of mouth (ventral cirri of segment 1 may approach each other to form analogous structures) [no known Floridan species] . . . . .
- . . . . . *Dysponetus* Levinsen
- Compound neurosetae with bidentate blades; appendage present on posterior rim of mouth . . . . . "Chrysopetalum caecum Langerhans"
- 3. Lateral and midline groups of notosetae of middle segments consisting of only spines (Fig. 29B, C) . . . . . *Hyalopale*, n. gen.
- Lateral and midline groups of notosetae of middle segments consisting of paleae or paleae and spines . . . . . 4
- 4. Four pairs of cirri on first 2 segments; middle group paleae of middle segments produced in several bundles (Figs. 1A, 11A–E) . . . . .
- . . . . . *Chrysopetalum* Ehlers
- Three pairs of cirri on first 2 segments; middle group paleae of middle segments produced otherwise . . . . . 5
- 5. Middle group paleae of middle segments produced in fan-shaped groups from 1 or 2 developmental centers . . . . . 6
- Middle group palea of middle segments produced separately, forming broad imbricate row . . . . . 8
- 6. Caruncle distinct; middle group paleae of middle segments produced from 2 developmental centers in fan-shaped rows, one behind other; compound neurosetae of middle segments with spinigerous blades . . . . .
- . . . . [no known Floridan species] . . . . "Paleanotus schmardai Mileikovsky"
- Caruncle absent or greatly reduced; middle group paleae of middle segments produced in single, fan-shaped, imbricate row from single developmental center; compound neurosetae of middle segments with falcigerous blades . . . . . 7
- 7. Caruncle absent; middle group paleae of middle segments nearly symmetrical, with symmetrical tips (Fig. 26A, F) . . . . . *Treptopale*, n. gen.
- Caruncle, if present, reduced to flattened structure; middle group paleae of middle segments distinctly asymmetrical, with margins convex laterally and concave medially (Fig. 1B–F) . . . . . *Paleanotus* Schmarda
- 8. Caruncle and mouth cover present; prostomium not retractile within anterior segments; dorsal cirri not retractile within cirrophores; midline group paleae of middle segments very stout; most lateral group paleae similar to middle group paleae but curved oppositely . . . . .
- . . . . . "Bhawania reyessi Katzmann, Laubier, and Ramos"
- Caruncle and mouth cover absent; prostomium retractile within anterior

segments; dorsal cirri retractile within cirrophores; midline group paleae of middle segments broad but thin; lateral group paleae distinctly different from middle group paleae (Figs. 21–25) . . . . . *Bhawania* Schmarda

*Chrysopetalum* Ehlers, 1864

*Palmyra*.—Grube, 1855:90 [in part; not Savigny, 1820].

*Chrysopetalum* Ehlers, 1864:80.—Quatrefages, 1866a:296.—Augener, 1913:79, 80.—Fauvel, 1923:122 [in part]; 1932:42; 1936a:16; 1953a:78.—Jorge, 1953: 103, 104.—Uschakov, 1955:146.—Mileikovsky, 1962:653.—Rullier, 1964: 142.—Laubier, 1968:80–83 [in part].—Orensanz, 1972:489–491 [in part].—Fauchald, 1977a:72.

*Palmyra* (*Palmyropsis*) Claparède, 1864:583.—Quatrefages, 1866b:655.

*Paleanotus*.—Day, 1962:635, 1967:116 [in part; not Schmarda, 1861].

*Type-species*.—*Chrysopetalum fragile* Ehlers, 1864 [*Chrysopetalum debile* (Grube, 1855); synonymy by Racovitza 1896:209]; by monotypy.

*Diagnosis*.—Body relatively long, slender, up to 65 segments. Prostomium visible dorsally, separated dorsolaterally from anterior segments, with 2 pairs of eyes, with short median antenna behind anterior eyes, with caruncle attached on posterior dorsal margin of prostomium, with elongate palps, mouth opening under rounded or triangular cover (mc). Segments 1 and 2 each with 2 pairs of elongate dorsal and ventral cirri, similar to dorsal cirri of following segments. Segment 2 uniramous, with paleate notosetae and acicula. Parapodia biramous from segment 3 on, with notopodial paleae and compound spinigerous neurosetae on anterior few segments, changing to compound falcigers on middle and posterior segments. Middle notopodia with long cirrophores, with cirrostyles long, with oval bases and filiform tips. Neuropodia with broadly rounded postsetal lobes; ventral cirri on short cirrophores medial to setae, shorter than dorsal cirri. Paleae of middle segments comprised of at least 3 groups arranged in broad, semicircular to almost straight rows, usually completely covering dorsum, extending from bundles occupying  $\frac{1}{2}$ – $\frac{2}{3}$  of segmental width, distinctly and equally serrate on both margins. Broad posterior paleal group, middle group (pm), consisting of 2–3 irregular transversely arranged rows or tiers of long, slender paleae spreading from up to 8 developmental centers; lateral and medial ones with tips asymmetrically bent toward middle of group; medial ones symmetrical, each with up to 12 internal ribs. Preacicular paleal group, lateral group (pl), consisting of up to 10 more slender, symmetrically-tipped, laterally-oriented paleae. Midline group paleae (pml) arranged in longitudinal to slightly oblique row of up to 6; each bent medially and posteriorly, shorter, more slender than those of middle group, with almost symmetrical tips. Compound falcigers with blades longer above, shorter below, serrate on margins, with hooked, unidentate tips. Pygidium with pair of anal cirri similar to dorsal cirri.

*Additional characters*.—The posterior margin of the prostomium extends to about the posterior margin of segment 4 and the bulbous, ciliated caruncle to about the posterior margin of segment 5 (Fig. 16A). The arrangement of cirri on segments 1 and 2 is shown on Fig. 11A–E and other figures. Upper, anterior, dorsal cirri are dorsal cirri of segment 2 (IId, IIdc). Cirri originating more proximally and below dorsal cirri of segment 2 are dorsal cirri of segment 1 (Idc, Id).

Ventral cirri of segment 2 (IIvc, IIv) originate below dorsal cirri of segment 3 (IIIIdc, IIIId). Ventral cirri of segment 1 (Ivc, Iv) originate ventral or ventrolateral to palps. Paleae of segments 2 and 3 are produced in inverted cones from apparently single developmental centers. They are slender, resembling lateral group paleae of middle segments on segment 2, gradually broader and more numerous on segment 3 and produced in an arc by segment 4. Lateral group paleae are first visible on segment 4 and well-developed by segment 6. Midline group paleae first appear on segment 5, but are biserrate. Triserrate midline paleae develop on segment 6 in those species which have them in middle segments. Lateral group and midline group paleae are produced from single developmental centers. The few upper compound falcigers, with shafts originating above or behind the aciculum, have blade margins oriented ventrally and usually distinctly longer and more slender than others. Blades of other falcigers are usually shorter and stouter, with blade margins oriented dorsally and gradually shorter ventrally. Additionally, some falcigers in the middle of each bundle have blades with long serrations (Fig. 2I). Further, parapodia of middle segments have glands containing spindles of fibers interspaced with granules in dorsal cirrophores (Fig. 11H), in posterior sides of neuropodia (Fig. 7B), and in bases of ventral cirri (Fig. 16F). Such glands also occur ventrally in the body between neuropodial lobes and longitudinal muscle bands. Interramal and dorsal interparapodial regions are ciliated.

*Remarks.*—*Chrysopetalum* was incorrectly referred to *Paleanotus* Schmarda by Day (1962:635). *Paleanotus* differs from *Chrysopetalum* in several characters. In *Paleanotus* the median antenna is anterior and originates in front of the anterior pair of eyes; palps are short and cushion-shaped; the mouth opening is simple and not covered by a rounded or triangular flap; a caruncle, if present, is poorly defined; there are only three pairs of cirri on the first two segments; large paleae of middle segments usually number only ten or fewer, are all similar with the medial margin straight or concave and usually lightly serrate, the lateral margin strongly convex and strongly serrate, the dorsal surface ornamented with longitudinal rows of cusps, and the internal structure being formed of usually more than 15 chambered ribs. In this regard, *Chrysopetalum macrophthalmum* Hartmann-Schröder (1959:94–96) is a *Paleanotus*.

Fauvel (1923:123) included *Chrysopetalum caecum* Langerhans from Madeira and *Palmyra (Palmyrides) portusveneris* Claparède from southern France in his account of *Chrysopetalum debile* (Grube). *Chrysopetalum caecum* is apparently a member of an undescribed genus. *Palmyra (Palmyrides) portusveneris* is a *Paleanotus*, according to Augener (1913:76, footnote).

Characters of specific importance include the degree to which the prostomium is turned anteriorly (Figs. 3A, 16A); the arrangement of the eyes; the presence of well-developed glands between parapodial rami containing bundles of rods (Figs. 5B, 7A); shapes, relative lengths, and detail of blades of neurosetae (Figs. 4K, L; 17J–L); type and degree of ornamentation of the dorsal surface of paleae (Figs. 2B, 12A, 15C); the shape of tips of paleae (Figs. 2B, 9D, 12A), whether blunt, obtuse or acute, hooded, with or without hood remnants, entire or bifid; presence or absence of a midrib on paleae of the midline group (Figs. 2C, 10A); the presence of spines (simple, biserrate notosetae having only one internal cross-barred rib) and small paleae aligned between lateral and midline paleae on the anterior side of the middle group (Fig. 3C, D); and differences in size and shape of paleae



within the lateral group (Fig. 14D). Specimen size, number of segments, and number of paleae in the middle group vary within broad limits and should be used with caution.

The overall shape, shape of the tips and number of internal ribs of paleae of the middle group seems to be fairly conservative, especially if ones of similar position and size are compared. The number of internal ribs is sometimes difficult to determine because of the difficulty in getting paleae to lie completely flat, thus obscuring the narrowest ribs which occur bilaterally. The presence of hoods or hood remnants on tips of fully emergent paleae seems to be related to their initial development. They seem to persist in species in which they are well developed upon emergence. Hooded tips may not occur on newly emerging paleae of all species. None were observed on *C. hernancortezae*, n. sp. However, a fragile hood was observed on an emerging palea of a single specimen of *C. elegans* Bush, and no hoods or hood remnants were observed on fully emergent paleae of the species.

#### Key to Floridan species of *Chrysopetalum*

1. Paleae ornamented with transverse ridges (Fig. 15C–E); anterior group paleae and spines lacking (Fig. 14D) . . . . . *C. heteropalea*, n. sp.
- Paleae ornamented with knobs; anterior group paleae and spines present . . . . . 2
2. Parapodia with interramal glands containing spindles of fibers (Fig. 7A); lateral and medial paleae of middle group with long, tapered tips . . . . . *C. elegans* Bush
- Parapodia without interramal glands; lateral and medial paleae of middle group with shorter, acute to obtuse, tips . . . . . 3
3. Long middle group paleae broad, with 12 internal ribs, symmetrically-tipped ones with almost blunt tips, lateral and medial ones with tips only slightly exceeding convex margins (Figs. 18H, I, 19C) . . . . . *C. eurypalea*, n. sp.
- Long middle group paleae more slender, with up to 10 internal ribs, all with more pointed, obtuse to acute tips . . . . . 4
4. Hoods or remnants of hoods absent on fully emergent paleae (Fig. 12A–E); distal serrations on falcigers long, extending about to tips (Fig. 13A–C) . . . . . *C. hernancortezae*, n. sp.
- Hoods or hood remnants present on paleae (Fig. 17A–C); distal serrations on falcigers not extending to tips (Fig. 17J–L) . . . . . *C. floridanum*, n. sp.

#### *Chrysopetalum debile* (Grube, 1855)

Fig. 2

*Palmyra debilis* Grube, 1855:90, 91, pl. 3, figs. 3–5.

*Chrysopetalum fragile* Ehlers, 1864:81–92, pl. 2, figs. 3–9.—Quatrefages, 1866a:296.—Claparède, 1868:417–418.—Marion and Bobretzky, 1875:9, 10.

?*Chrysopetalum debile*.—Ehlers, 1864:80 [*P. debilis* questionably referred to *Chrysopetalum*].

*Palmyra (Palmyropsis) evelinae* Claparède, 1864:586, 587, pl. 8, fig. 6.—Quatrefages, 1866b:655.

*Chrysopetalum debile*.—Quatrefages, 1866a:296.—Racovitza, 1896:209–216, pl.

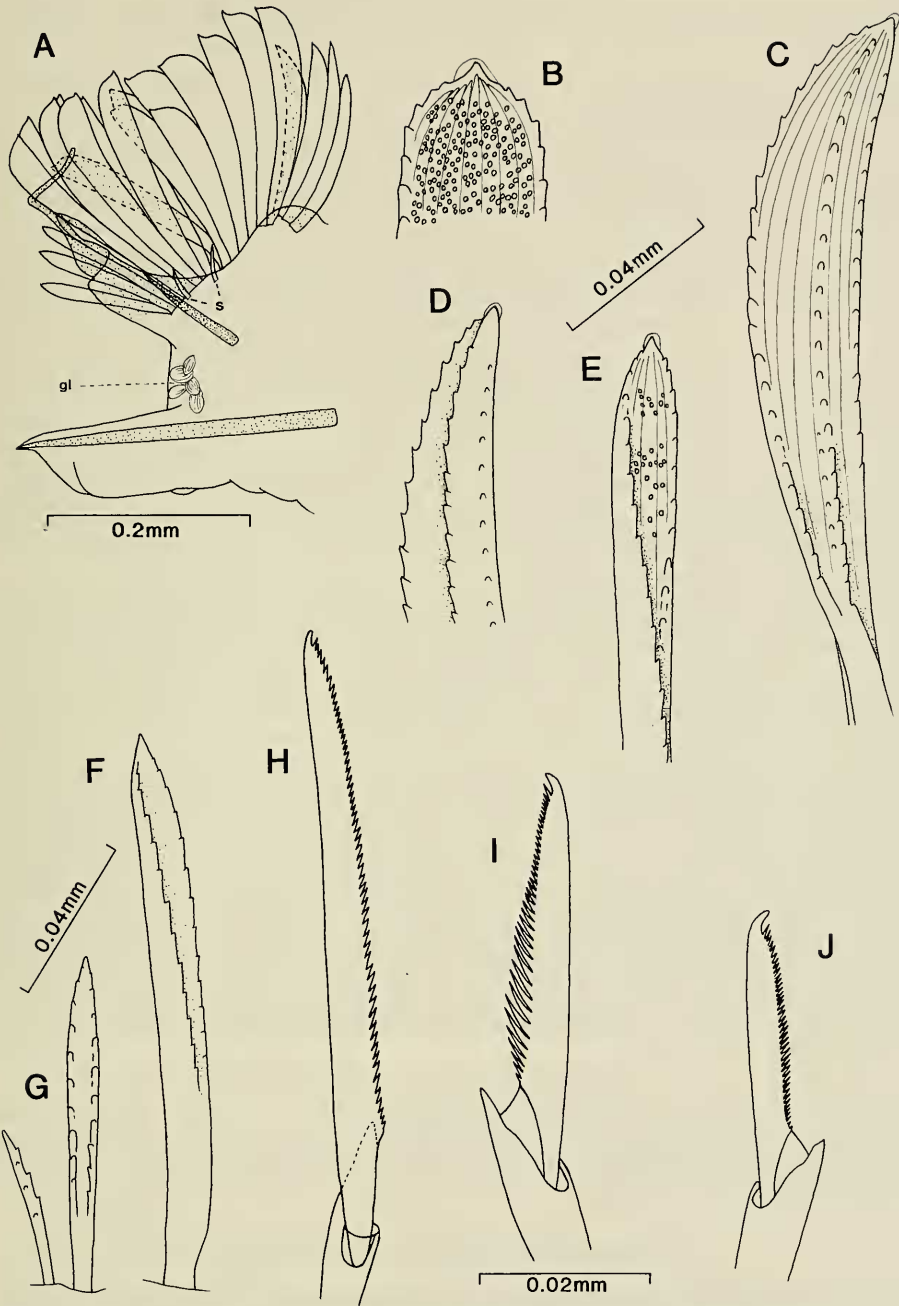


Fig. 2. *Chrysopetalum debile*, middle segments (ZMH P-14047): A, Left parapodium, anterior view; B, Tip of symmetrical palea, center of middle group, showing surface knobs and internal ribs, dorsal view; C, Palea, midline group, showing surface midrib and internal ribs; D, Same, turned; E, Palea, lateral group; F, Shortest lateral group palea, small specimen; G, Small lateral group palea and spine, right side of another parapodium of same; H, Upper compound falciger; I, Middle compound falciger; J, Lower compound falciger.

3, fig. 27, pl. 4, figs. 28–34.—Fauvel, 1923:123, fig. 44r–u [in part].—Laubier, 1968:80, 81.

*Chrysopetalum*.—Jorge, 1953:103, 104, figs. 5–7, 10 [species name not given but apparently *C. debile*].

*Material examined*.—FRANCE, MEDITERRANEAN SEA: Banyuls-sur-Mer, “*Otoplana*: Turbellaria zone” (lowest intertidal zone sensu Adolph Remane), 2 specimens (ZMH P-14047).

*Description*.—Body with about 40 segments. Anterior eyes circular, separate, of moderate size. Notosetae consisting of paleae and spines (Fig. 2A–G). Tips of paleae hooded, entire; dorsal surface moderately to strongly knobbed; paleae of middle group numbering 20 to 25; symmetrical ones in middle with obtuse tips and 8 internal ribs; palea of midline group about 4, with denticulate surface midrib; preacicular paleae all slender, often diminishing anteromedially to small palea and spine. Anterior notosetae consisting of up to 3 spines. Blades of compound falcigers (Fig. 2H–J) moderately long; upper few blades distinctly longer than adjacent ones, gradually shorter below; distal serrations of blades of upper falcigers extending about to tips, shorter below. Anterior side of parapodia apparently with interramal glands containing spindles of fibers, but not well developed.

*Remarks*.—On borrowing these specimens from Banyuls for examination, I assumed, as have others (Laubier 1968), that only one species of *Chrysopetalum* occurs in the Mediterranean area. After discovering several species among specimens from Florida, I have some doubt that my assumption was correct and conclude that the types, if extant, should be examined.

The two specimens examined were collected near the type-localities of *Palymra debilis*, Villafranche, and *Palmyra (Palmyropsis) evelinae*, Port-Vendres, on the south coast of France. The type-locality of *C. fragile* is Quarnero (=Kvarner), Yugoslavia, in the northwestern Adriatic Sea. All the types probably came from shallow water or intertidal areas, as did the specimens examined. It is probable that all belong to the same species and are the same as specimens examined. Even the detail of the tips of the paleae is no indication to the contrary. In his discussion of specimens from Australia referred to *C. occidentale* Johnson, Augener (1913: 79) noted that paleae of *C. debile* (no locality stated, but probably Mediterranean) were hooded.

I examined parts of a single parapodium of a specimen from South Africa identified as *Paleanotus debilis* (= *Chrysopetalum*) by J. H. Day. Middle Group paleae of the specimen appeared to have completely smooth dorsal surfaces, so the specimen is probably not the same species as *C. debile*.

#### *Chrysopetalum elongatum* (Grube, 1856)

*Palmyra* (?) *elongata* Grube, 1856:51, 52.—Quatrefages, 1866a:298.—Augener, 1925:5.

?*Chrysopetalum* spec.—Augener, 1925:5, 45 [questionably = *C. elongatum*, fide Augener].

*Remarks*.—Because *C. elongatum* was described from St. Croix, Virgin Islands, near the area of study, it seems prudent to discuss the current status of the species. The original description was very brief, without figures and based on a single,



poorly preserved specimen of 48 segments and 6 lines (approx. 13 mm) long. The specimen was supposedly collected by Örsted at St. Croix. Grube stated that the species might be a member of a new genus and inserted a (?) between names of the genus and species to indicate this. Augener (1925:5) did not find the holotype in the Copenhagen Museum and stated that the description was adequate only to indicate that the specimen was a Chrysopetalidae. However, because of Grube's remarks that the species resembled *Palmyra debilis* Grube and that it differed from *Palmyra aurifera* [=Aphroditidae] in the form of the ventral setae, Augener continued to maintain the species as *Chrysopetalum elongatum*. Grube's description also stated that basal articles of dorsal cirri were very stout and suboval, and this further suggests that his specimen was a *Chrysopetalum*.

In the same species account, Augener (1925) reported on a *Chrysopetalum* specimen from St. Croix in the University Zoological Museum, Copenhagen, under the name of *Palmyra fragilis* Grube. He thought the specimen might be an example of *P. elongata* but did not conclude that it was the type. There are two original labels in the vial containing the specimen. One is very small, showing "St. Croix" and "Kr" (=Krøyer). The other is a postage stamp-sized label with the information: "11/3-57; 18/9-45; *Palmyra fragilis* Ørst. Gr.; St. Croix; Krøyer" (Mary Petersen, in litt.) and is probably the "hand written note of Krøyer" mentioned by Augener. The name *P. fragilis* is an obvious misidentification; however, it is possible that it was subsequently applied as a museum name to the type of *Palmyra elongata*. The name "Ørst." on the tag may be an indication that this was the specimen examined by Grube, and the specimen is apparently the only one which may possibly be the type of *Palmyra elongata*. However, this cannot be confirmed because, in addition to the conflicting information on the jar tags, the specimen differs from the one originally described by Grube in having 58 segments and being fairly well preserved (Augener 1925:5; Mary Petersen, in litt.). Further, records of the Copenhagen Museum indicate that the specimen was collected by Krøyer (Mary Petersen, in litt.) and not by Örsted, as stated in Grube's account. According to Augener, paleae (i.e., paleae of the middle group) of the *Chrysopetalum* spec. are more pointed on the tip and more slender than those of *Chrysopetalum debile*. I have not been able to examine the specimen and thus cannot comment further or propose any action which might clarify its status.

*Chrysopetalum occidentale* Johnson, 1897

Figs. 3, 4

*Chrysopetalum occidentale* Johnson, 1897:161, pl. 5, figs. 15, 16, pl. 6, figs. 17-19.—Monro, 1933:19.—Hartman, 1961:56, 57; 1968:185, 186, figs. 1-5.—Fau-chald, 1977a:71, fig. 18a-c; 1977b:10.

*Chrysopetalum paessleri* Augener, 1912:163, 164, pl. 5, figs. 1, 2.

*Material examined*.—CALIFORNIA: Catilina Is., White Cove, shore, from (algal) holdfasts, *Velero* III Sta 1370-41, 20 specimens (AHF).—Same, 1 mi NW of White Cove, 2-3 fms, from *Eisenia* holdfasts, *Velero* III Sta 1378-41, 10 specimens (AHF). MEXICO: Cedros Is., Mar 1959, 1 specimen (plus 10 young specimens; AHF N-14111).

*Description*.—Largest specimen (*Velero* III Sta 1378-41) 14 mm long, 1.6 mm wide without setae, tapered anteriorly and posteriorly, 66 segments; specimen

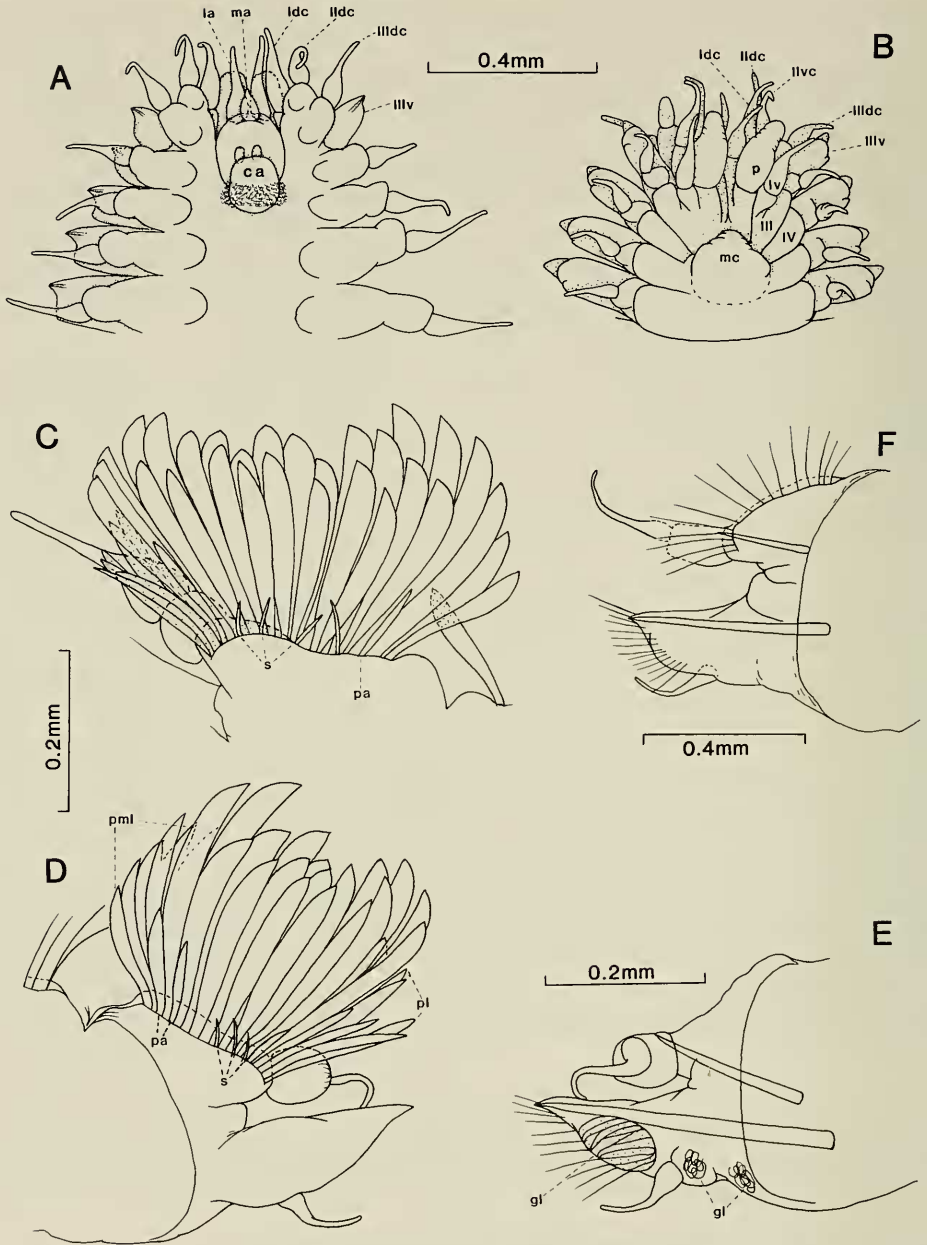


Fig. 3. *Chrysopetalum occidentale*: A, Anterior end, dorsal view; B, Same, ventral view; C, Left notopodium, middle segment, anterior view; D, Right parapodium, middle segment, anterior view; E, Same, left side, paleae omitted; F, Same, right side, posterior view (A, B, E, *Velero* III 1378-41; C, D, F, Cedros Is., AHF).

from Cedros Is. (AHF N-14111) 5 mm long, about 50 segments. Prostomium of mature specimens (Fig. 3A) turned anteriorly; anterior eyes visible through dorsal integument, facing anteriorly, oval, about 2 times longer than wide, closely appressed, line separating them almost straight, together forming large single pigment

spot; posterior eyes separated, oval, in about middle of dorsal surface; median antenna originating on anterior margin of dorsal surface, directed anteriorly; lateral antennae originating below, partly covered by anterior part of prostomium; caruncle large, overlying about posterior  $\frac{1}{3}$  of prostomium; palps originating ventrally well back from anterior margin (Fig. 3B). Parapodia as figured (Fig. 3C–E). Notosetae consisting of paleae and spines (Figs. 3C, D, 4A–J). Tips of paleae entire, with remnants of hoods on middle and midline groups; dorsal surface of paleae moderately to strongly knobbed; middle group paleae of middle parapodia of mature specimens from California numbering 35–40, about 30 on smaller specimen from Cedros Is., Mexico; longer symmetrical ones in middle of group with obtuse tips, with 8–10 internal ribs; anterior (older) paleae much shorter than posterior (later formed) paleae. Midline group paleae about 6, each with denticulate surface midrib. Lateral group paleae all slender, diminishing to spine anteromedially. Anterior group notosetae including 3–4 spines and 1, rarely 2, small, biserrate paleae near to but separated from triserrate midline paleae. Blades of compound falcigers (Fig. 4K, L) moderately long, upper few distinctly longer than adjacent ones, gradually shorter below, each with distal serration well short of tip. Interramal region on anterior side of parapodia ciliate, without glands containing spindles of fibers.

*Remarks.*—The original description of *Chrysopetalum paessleri* Augener from Nicaragua is in good agreement with specimens of *C. occidentale* from southern California, and I see no reason to maintain that name.

Specimens from the northwest Pacific Ocean reported as *C. occidentale* by Uschakov (1955), and Imajima and Hartman (1964) are apparently a different species. Laubier (1968) examined specimens from that area loaned to him by Uschakov and stated that notosetae began on segment 1 and neurosetae began on segment 2. Notosetae begin on segment 2 and neurosetae begin on segment 3 on all specimens of *Chrysopetalum* that I have examined.

*Chrysopetalum occidentale* was also reported from Australia by Augener (1913). Hartmann-Schröder (1982) reported specimens of *Paleanotus debilis* [= *C. debilis* (Grube)] from Australia, and noted that paleae of the specimens were hooded; she referred Augener's Australian specimens to that species. The presence of well-developed hoods on the specimens from Australia certainly indicates that they differ from *C. occidentale*.

Elimination of northwest Pacific and Australian specimens limits *C. occidentale* to northeast Pacific areas from southern California to Panama (Fauchald 1977b). Specimens of *Chrysopetalum occidentale* of Gathof (1984) from the Gulf of Mexico are referred to *C. hernancortezae*, n. sp.

*Chrysopetalum elegans* Bush, 1900

Figs. 5–7

*Chrysopetalum elegans* Bush in Verrill, 1900:668, 669.—Hartman, 1942:15.

*Material examined.*—BERMUDA: 1–3 ft, colls. A. E. Verrill and party, 1898, 1 complete and 1 middle fragment, syntypes (YPM 1154). FLORIDA: near S Palm Beach-Broward County line, on *Phragmatopoma*, 1.3 m, coll. H. Rudolph, Jan 1975, 4 specimens (USNM 97347; FSBC I 31381; H. D. Rudolph).—Dade County, S. Biscayne Bay, near E end of Florida Power and Light Turkey Point power plant channel, 50 ft NW of channel marker No. 2, in *Thalassia* bed, colls.



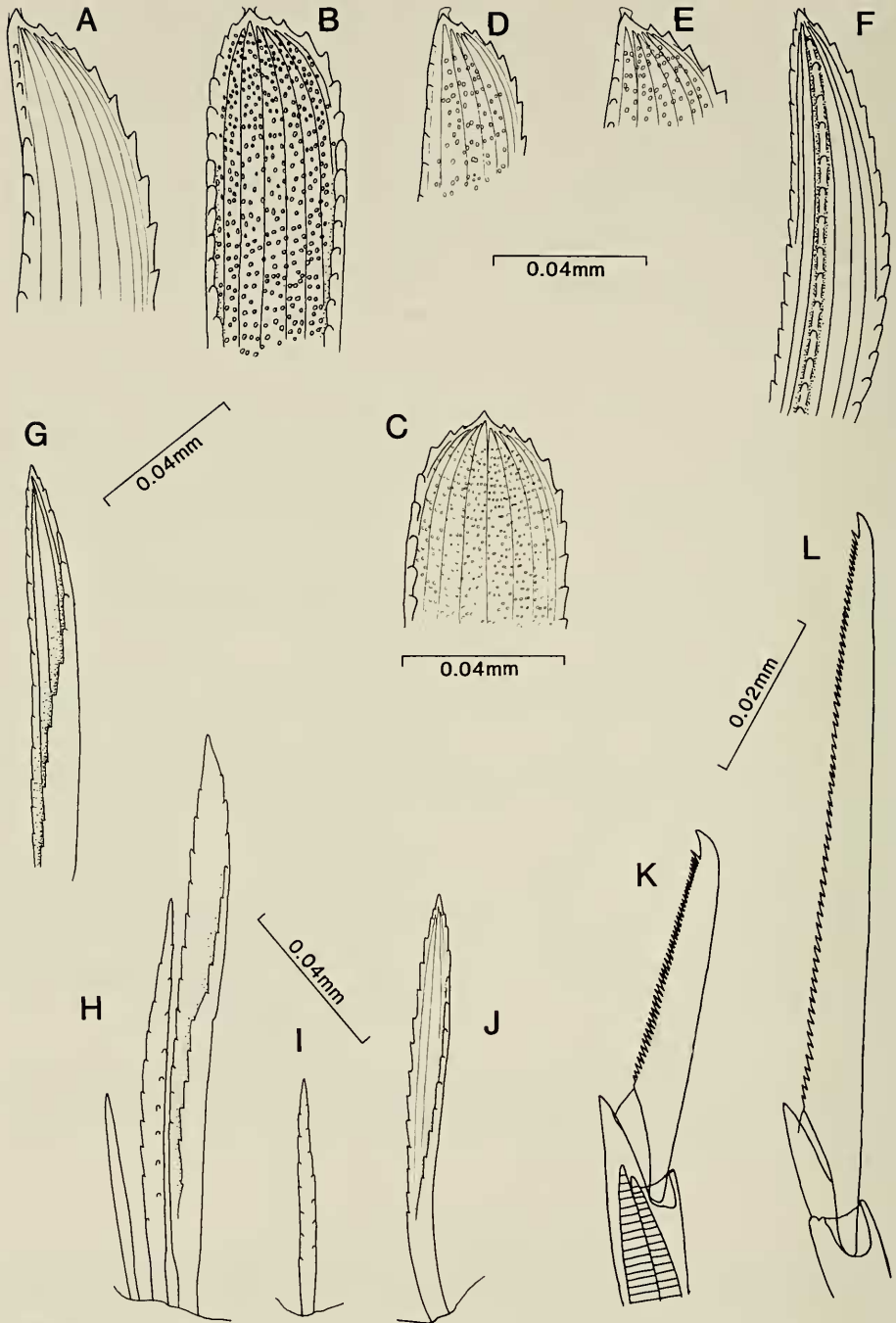


Fig. 4. *Chrysopetalum occidentale*, setae, middle segments; A, Lateral palea, middle group; B, Center palea, middle group, showing knobbed surface; C, Symmetrically-tipped palea from center of middle group; D, E, Tips of newly emerging paleae, middle group; F, Palea, midline group; G, Palea, lateral group; H, Smaller paleae and adjacent spine, lateral group, right notopodium; I, Spine, anterior group; J, Small palea, anterior group; K, Lower compound falciger; L, Upper compound falciger (A, C, H-J, *Velero* III 1378-41; B, D-G, *Cedros* Is; K, L, *Velero* III 1370-41).

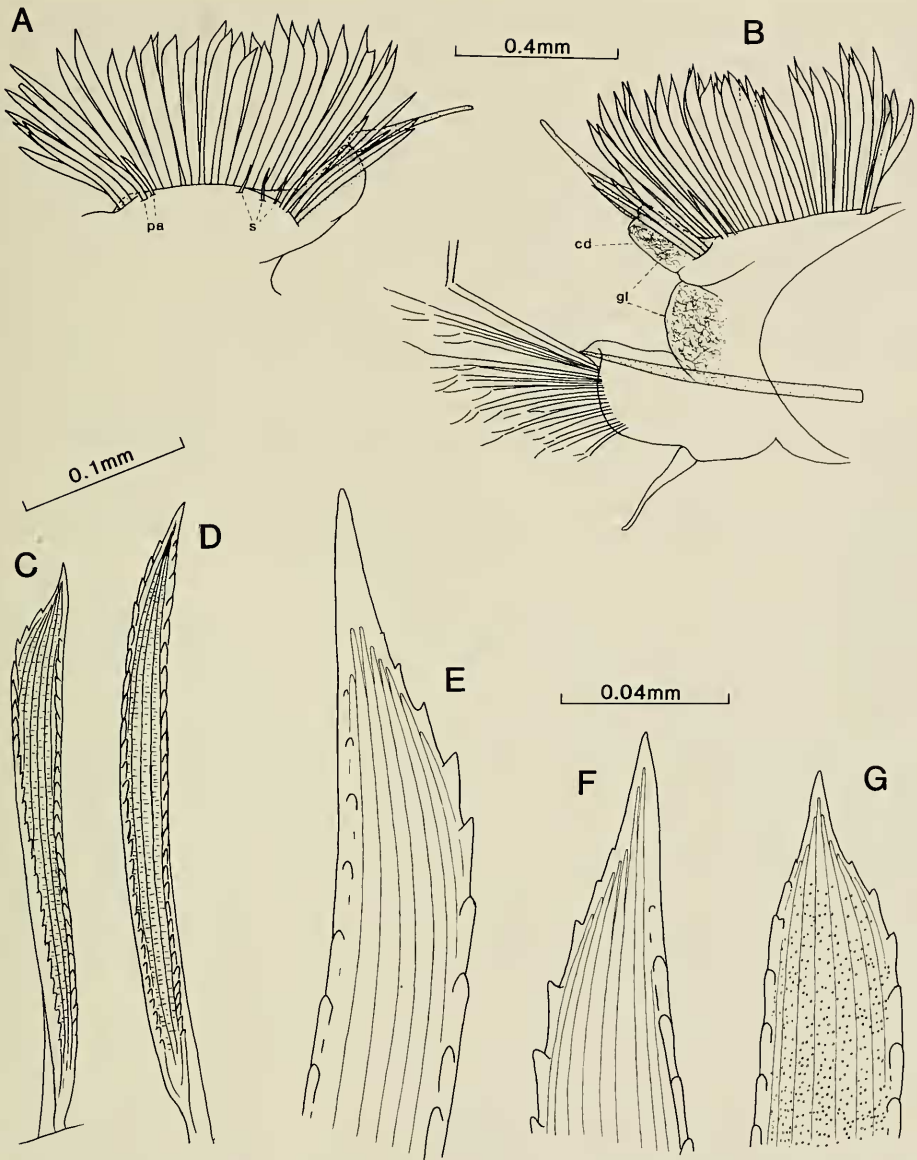


Fig. 5. *Chrysopetalum elegans*, middle segments of syntypes: A, Right notopodium, anterior view; B, Left parapodium anterior view; C, D, Paleae, middle group; E, F, Tips of same, from lateral part; G, Same, from central part, dorsal surface showing surface knobs (A–E, G, Middle fragment; F, complete specimen).

DER personnel, Nov 1978, 1 specimen (USNM 97346).—Same, DERM Sta 16, Ragged Keys, at edge of channel between 2 keys, 25°32'01"N, 80°10'17"W, 2–3 m, scoured hard bottom from high current flow, 1 specimen (USNM 97348).—Florida Keys (Monroe County): exact locality unknown, colls. DER personnel, 1 specimen (YPM). Looe Key National Marine Sanctuary, reef crest, coralline covered rubble, less than 1 m, Sta FLK-2, 1 specimen (USNM 97521).—Same, Sta

FLK-3, 1 specimen (USNM 97522).—Same, rubble with low scattered algal growth, Sta FLK-5, 4 specimens (USNM 97523).—Same, clumps of *Halimeda*, Sta FLK-6, 1+ specimens (FSBC I 31756).—Same, clumps of *Halimeda* growing on buttress in spur and groove zone, 2–6+ m, Sta FLK-13, 2 specimens (USNM 97524).—Same, lagoon in front of reef crest, 1+ m, Sta FLK-23, 1 specimen (USNM 97525).—Same, at base of upper spur and groove buttress, coral rubble, 6+ m, Sta FLK-25, 5 specimens (USNM 97526).—Northeast Gulf of Mexico, 100 mi S of Panama City, on pelagic *Sargassum*, R/V *Hernan Cortez*, coll. B. Presley, Aug 1966, 1 young specimen (FSBC I 31382).

*Description*.—Complete syntype curled, 12 mm long, 2 mm wide, 65 segments [15 mm long according to Bush]; Florida specimens much smaller, up to 6 mm long, 50 segments. Prostomium appearing oval, longer than wide. Eye pigment not conserved on syntype; apparently 2 pairs [Bush reported 3 pairs of black spots; the intermediate “second pair” she reported were apparently pigment spots visible on freshly collected specimens; seen on some other species from Florida]; anterior eyes large, oval, closely appressed on some specimens, smaller, round, separated on others; median antenna short, fusiform. Notosetae consisting of paleae and spines (Figs. 5A–G, 6A–F, 7A, C–F). Middle group paleae slender on syntypes, symmetrical middle ones and perhaps others slightly broader on most Florida specimens; tips entire, without hoods or hood remnants; dorsal surface lightly knobbed; middle group paleae of middle parapodia numbering 20–30, with internal ribs numbering 6–8 on lateral ones, 8–10 on central ones; longer symmetrical ones in center of middle group with long, tapered tips on syntypes, with acute tips on most Florida specimens; lateral and medial paleae of middle groups of all specimens with long, tapered tips. Midline group paleae up to about 6, each with denticulate surface midrib. Lateral group paleae more numerous, all similar, slender, gradually diminishing to spine anteromedially. Anterior group notosetae consisting of about 2 short, slender, biserrate paleae without denticulate surface midrib, slightly separated from midline paleae, and 2–3 spines. Blades of compound falcigers (Figs. 6G–I) moderately long, upper few distinctly longer than adjacent ones, gradually shorter below, each with distal serration back from tip and distinct projection or knob at proximal end of serrate margin; upper blades with short, stout serrations; several in middle of bundle with moderately long serrations; lower ones with short, fine serrations. Interramal region on anterior side of parapodia with large gland containing spindles of fibers (Figs. 5B, 7A).

*Remarks*.—*Chrysopetalum elegans* differs from other species of the genus in having a well-developed gland containing spindles of fibers in the interramal region. Notosetae of *C. ehlersi* Gravier, 1901, from Djibouti, Gulf of Aden, are similar to those of *C. elegans*, but blades of neurosetae are much more slender. Interramal glands are not known for *C. ehlersi*. A fragile hood was observed on the tip of an emerging palea of the middle group of one specimen (USNM 97522); however, no evidence of hoods or remnants was observed on fully emergent paleae.

*Chrysopetalum remanei*, new species

Figs. 8–10

*Chrysopetalum debile*.—Hartmann-Schröder, 1960:71 [not *Palmyra debilis* Grube, 1855].

*Material examined*.—RED SEA, EGYPT: Hurghada (Ghardqua), colls. A. Re-



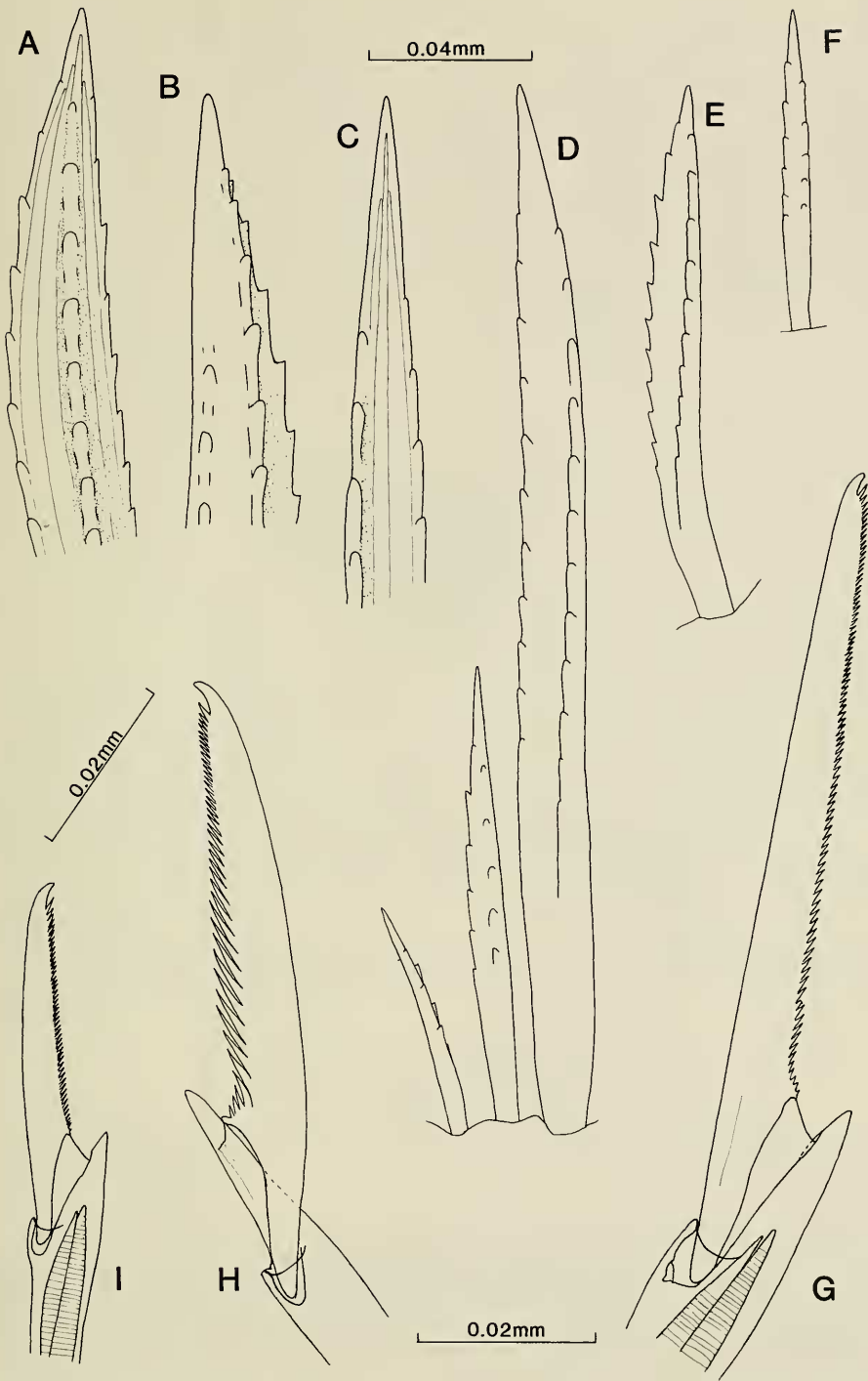


Fig. 6. *Chrysopetalum elegans*, middle segments of syntypes: A, Tip of palea, midline group; B, Same, turned; C, Tip of palea, lateral group; D, Smaller paleae and adjacent spine, lateral group of right notopodium; E, Palea, anterior group, near midline; F, Same, slightly more lateral; G, Upper compound falciger; H, Middle compound falciger I, Lower compound falciger (B, complete specimen; remainder, middle fragment).

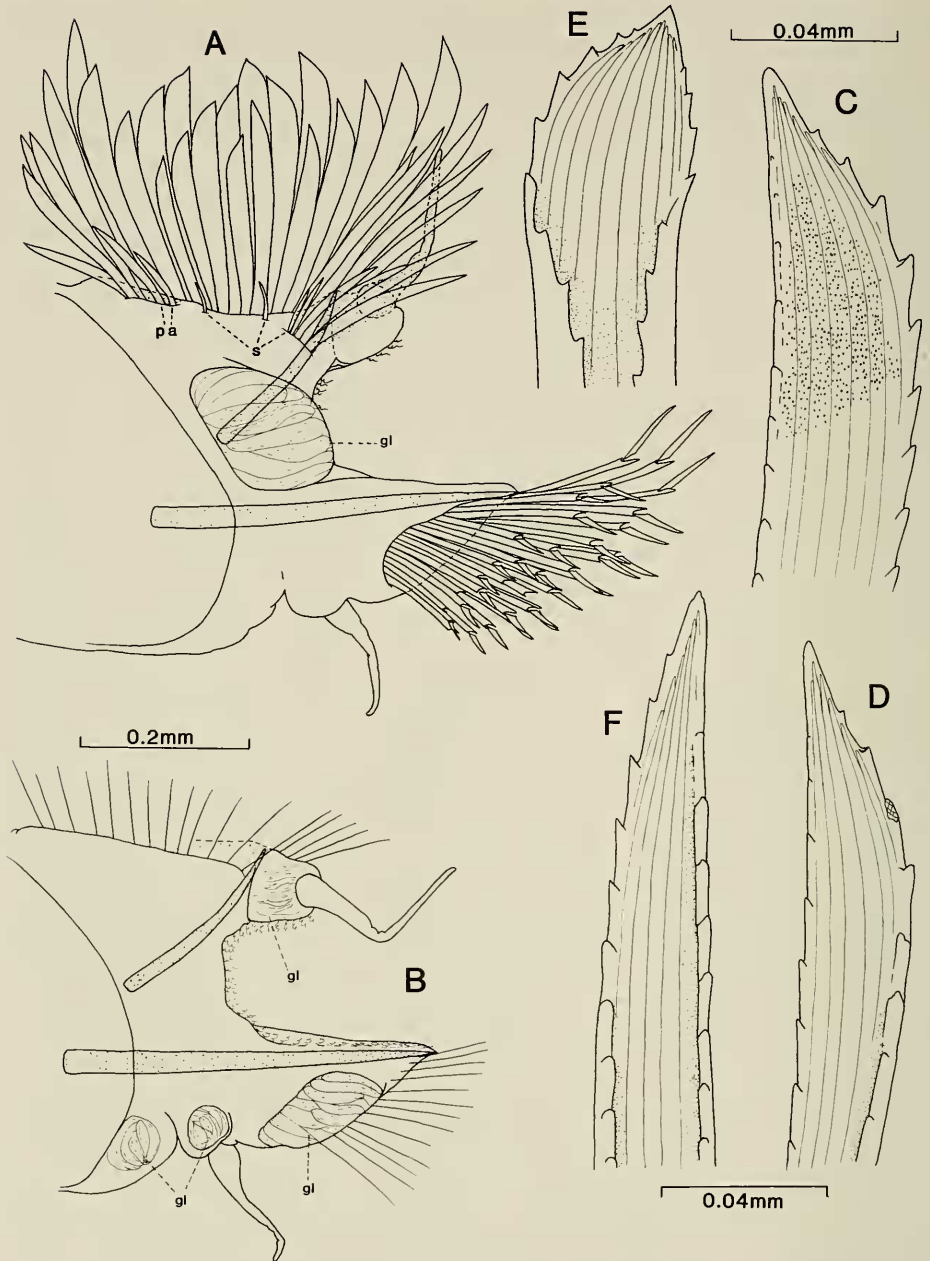


Fig. 7. *Chrysopetalum elegans*, Biscayne Bay, Florida, middle segments (USNM 97348): A, Right parapodium, anterior view; B, Same, left side, posterior view, tips of setae omitted; C, Palea, middle group, from near lateral part; D, Same, small, from lateral part; E, Same, from central part; F, Same, from medial part.

mane and E. Schulz, 18–29 Mar 1956, holotype (ZMH P-14048), 6 paratypes (ZMH P-18231), paratype (USNM 97349), 7 segments (FSBC I 31374).

*Description.*—Holotype complete, 23 segments, 1.8 mm long; paratypes incomplete, fragmented, largest probably less than 5 mm long, 0.9 mm wide excluding setae, probably with fewer than 40 segments. Prostomium about as wide as long, with anterior  $\frac{1}{3}$  turned ventrally and facing anteriorly (Fig. 8B, D); eyes in rectangular arrangement, anterior ones larger, separated from each other; median antenna short, pyriform; lateral antennae perhaps extending farther than palps and shorter than cirri of segments 1 and 2; palps (Fig. 8A, C, E) attached antero-ventrally on prostomium below lateral antennae, twice longer than wide. Mouth cover extending from anterior part of segment 4, semicircular when proboscis inverted. Caruncle nearly as wide as prostomium, with cilia visible around margin. Notosetae consisting of paleae and spines (Figs. 9A, D, 10A–E); tips of paleae hooded, bifid; dorsal surface moderately to strongly knobbed; middle group paleae of middle segments numbering up to 25, longer symmetrical ones in center of group with obtuse tips; midline group paleae numbering 4 or 5, without denticulate, surface midrib; lateral group paleae numbering 6–9, all slender, diminishing to spine anteromedially. Anterior group notosetae consisting of about 2 spines near lateral group and single 2-ribbed palea near midline group. Blades of upper few compound falcigers (Fig. 10G) relatively short, not distinctly longer than adjacent ones and only about twice longer than lowest ones; blades gradually shorter ventrally (Fig. 10H, I); serrations on upper blades short, with distal one extending to near tip; several blades in middle of bundle with moderately long serrations, with distal serration removed from tip; remainder with similar tips and short serrations. Interramal regions of middle parapodia ciliate on anterior side, without glands containing spindles of fibers (Fig. 9B, C); spindles of fibers possibly produced in notopodium proximal to dorsal cirrophore.

*Remarks.*—*Chrysopetalum remanei* differs from other species of the genus in having paleae with bifid tips and paleae of the midline group without a denticulate, surface midrib.

*Etymology.*—The species is named in honor of the late Adolf Remane, former Director of the Zoological Institute of the University of Kiel, who collected the specimens.

*Chrysopetalum hernancortezae*, new species

Figs. 11–13

*Chrysopetalum occidentale.*—Gathof, 1984:24-6, figs. 26-1, 26-2a-c [not Johnson, 1897].

*Material examined.*—FLORIDA (Gulf of Mexico): off Dunedin, Pinellas County, EGMEX 70, Sta 22, 28°04'N, 84°41'W, 77 m, R/V *Hernan Cortez*, colls. J. Williams et al., May 1970, 8 paratypes (USNM 97354).—Hourglass Sta C, 38 nmi W of Egmont Key, 27°37'N, 83°28'W, 37 m, 1 specimen (FSBC I 31327).—Same, Sta D, 65 nmi W of Egmont Key, 27°37'N, 83°58'W, 55 m, 9 paratypes (USNM 97351; FSBC I 31328), 66 specimens (FSBC I 31329–31345).—Same, Sta E, 78 nmi W of Egmont Key, 27°37'N, 83°13'W, 73 m, holotype (USNM 97350), 3 paratypes (USNM 97353; FSBC I 31346), 10 specimens (FSBC I 31347–31353).—Same, Sta K, 51 nmi W of Sanibel Is. Light, 26°24'N, 82°58'W, 37 m,



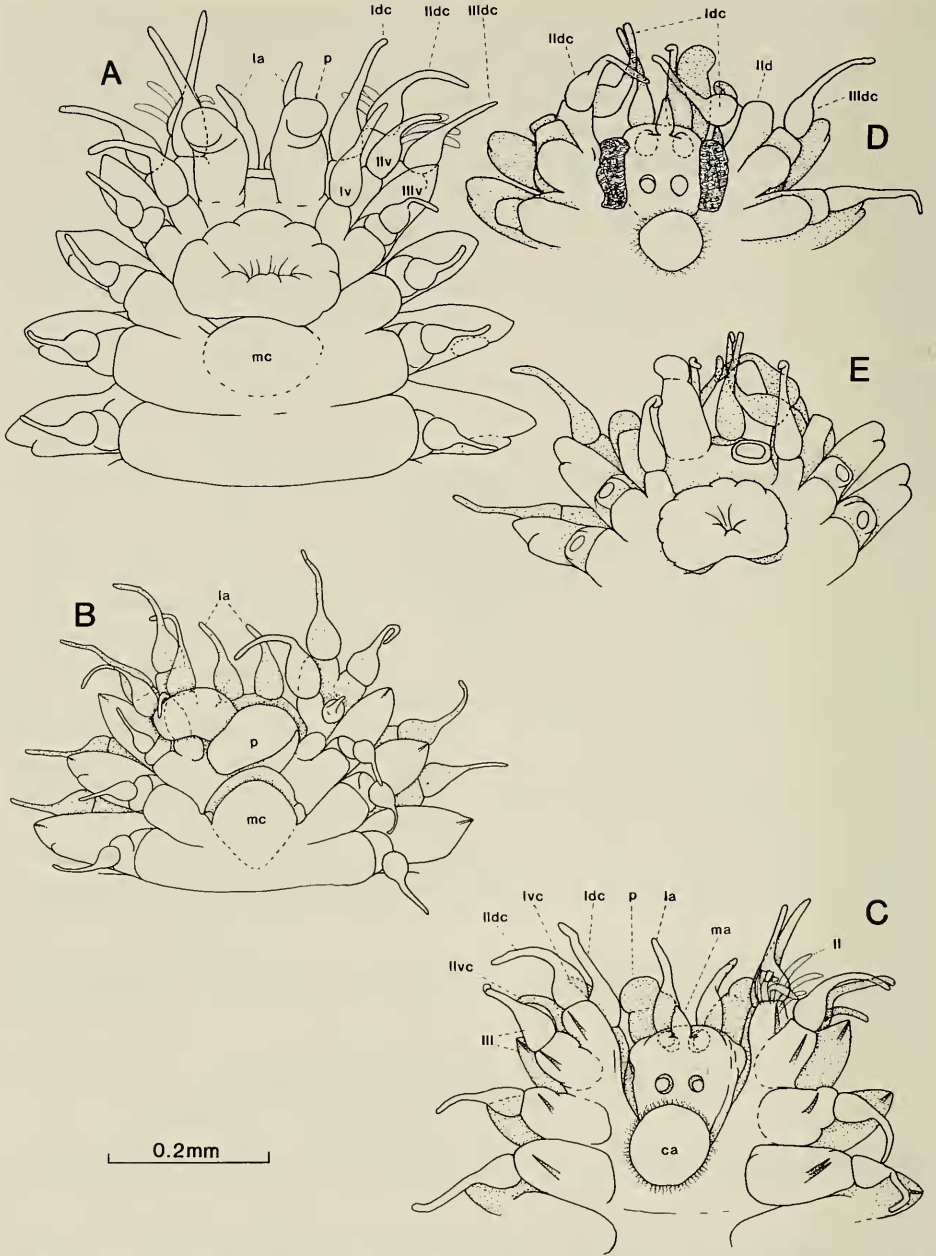


Fig. 8. *Chrysopetalum remanei*, anterior ends: A, B, E, Ventral views; C, D, Dorsal views (A, C, paratype, B, holotype, ZMH; D, E, paratype, USNM).

2 specimens (FSBC I 31354, 31355).—Same, Sta L, 73 nmi W of Sanibel Is. Light, 26°24'N, 83°22'W, 55 m, 109 specimens (FSBC I 31356–31367, 31369, 31370).—Same Sta M, 92 nmi W of Sanibel Is. Light, 26°24'N, 83°43'W, 73 m, 4 paratypes (USNM 97352; FSBC I 31371).—About 80 mi W of Fort Myers Beach, 52.5–54

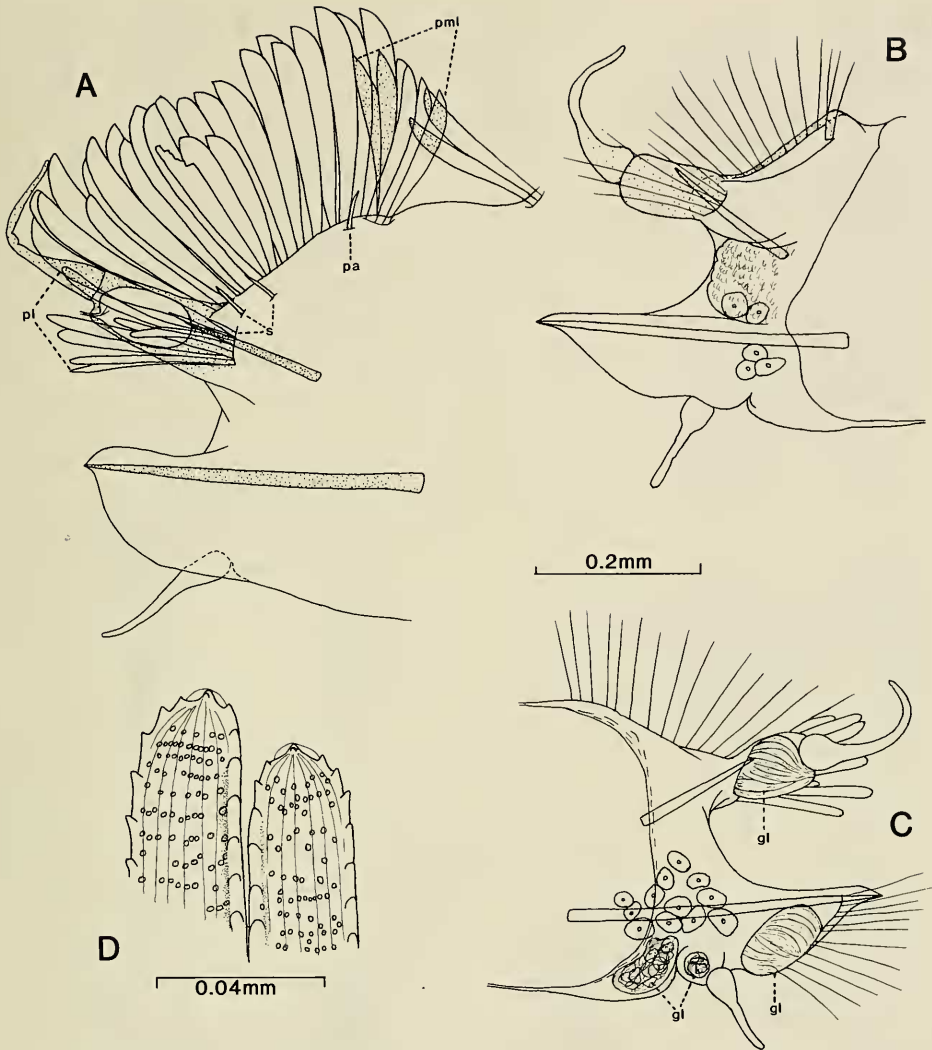


Fig. 9. *Chrysopetalum remanei*, middle segments (FSBC I 31375): A, Left parapodium, anterior view; B, Same, tips of paleae omitted; C, Same, posterior view; D, Tips of paleae from near center of middle group.

m, 1 specimen (FSBC I 31373).—MAFLA Sta 2958, 25°40'N, 83°50'W, 120 m, Nov 1977, 1 specimen (USNM 75181).—SOFLA Sta 4, 26°45'49"N, 83°32'07"W, 56 m, Jul 1981, 3 specimens (USNM 90632).—Same, Sta 28, 24°47'07"N, 83°13'05"W, 58 m, Aug 1981, 1 young, 1 segment (USNM 90633). FLORIDA (Atlantic): On *Oculina*, ENE of Fort Pierce, Jeffs Reef, 27°32.8'N, 79°58.8'W, 80 m (Site A of Reed, 1980, fig. 1), 19 specimens (USNM 97355, 97356; FSBC I 31374; IRCZM 50:993–996).

*Description*.—Holotype 8 mm long, 46 segments; largest specimen about 10 mm long, 1.2 mm wide excluding setae, 48 segments. Prostomium (Fig. 11A) as wide as long, anterior half turned ventrally with anterior eyes facing anteriorly;

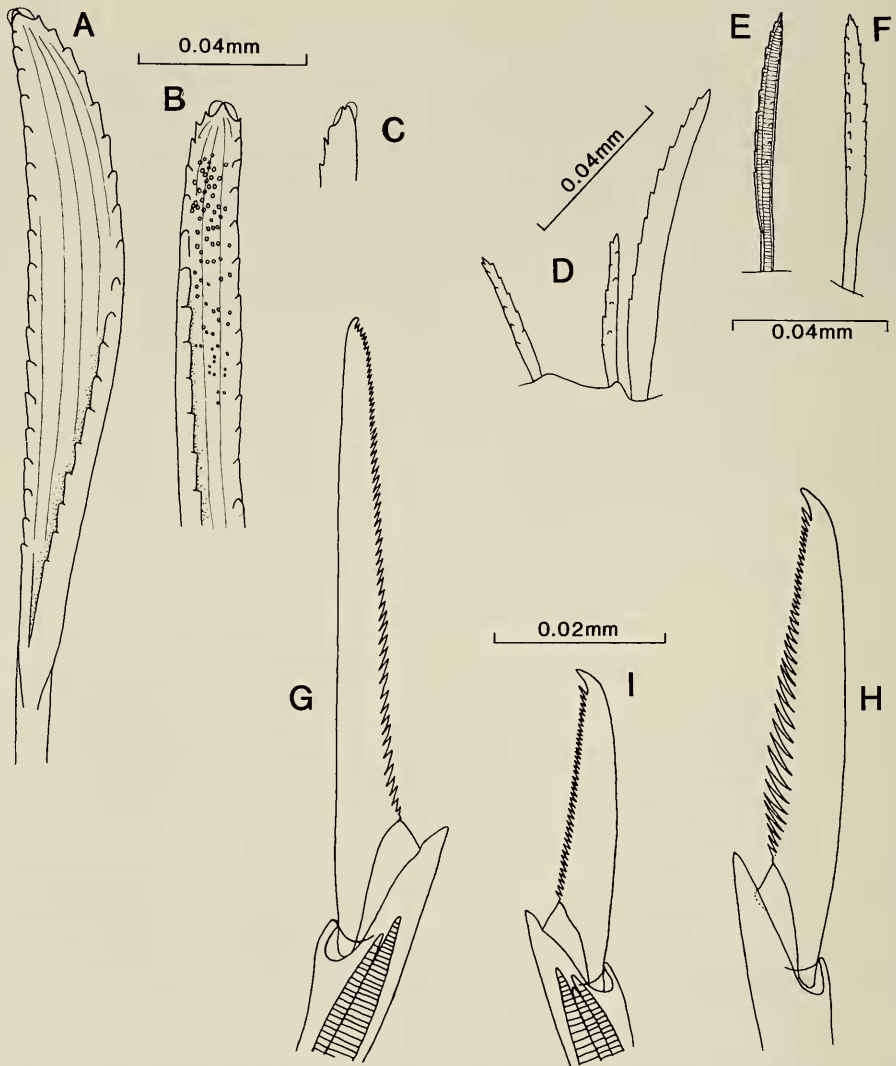


Fig. 10. *Chrysopetalum remanei*, setae from middle segments (FSBC I 31375): A, Palea, midline group; B, Palea, lateral group, showing surface knobs; C, Same, turned, showing hood and bifid tip; D, Smallest palea and spine, lateral group, and adjacent spine of anterior group, right notopodium; E, Slender palea, anterior group, showing internal structure; F, Same, internal structure omitted; G, Upper compound falciger; H, Middle compound falciger; I, Lower compound falciger.

eyes in rectangular arrangement, anterior ones larger than posterior ones, appressed, round or slightly oval; median antenna pyriform; lateral antennae similar to dorsal cirri; palps (Fig. 11B, C) attached at about middle of ventral surface of prostomium, appearing near anterior margin on contraction, 2-3 times longer than wide. Mouth cover extending from anterior margin of segment 5, semicircular, triangular when proboscis inverted. Caruncle slightly flattened, with long, dense ciliation around lateral and posterior margins. Notosetae consisting of paleae and spines (Figs. 11D-F, 12A-J); tips of paleae entire, without trace of hood; dorsal surface lightly to moderately knobbed. Middle group paleae of middle



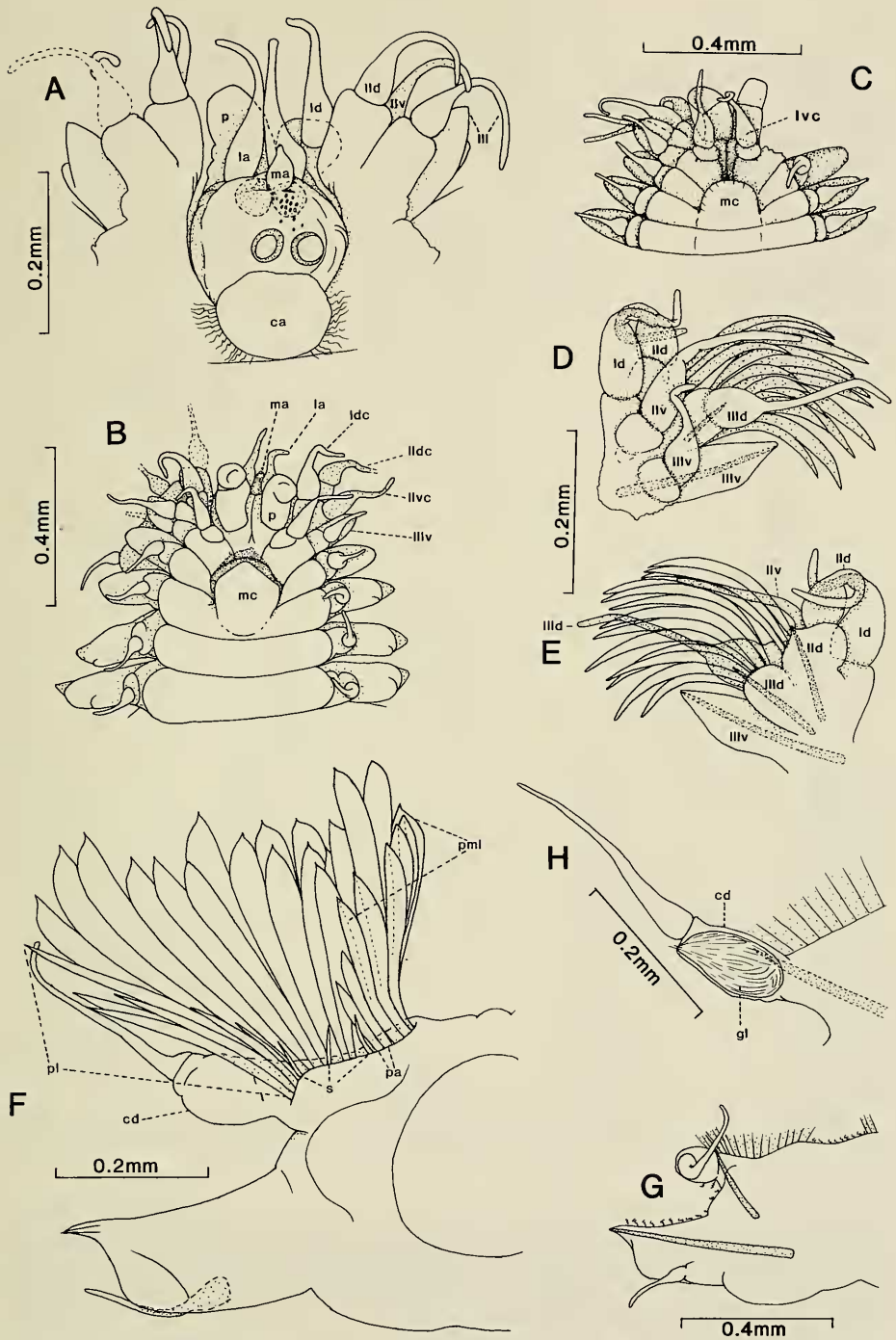


Fig. 11. *Chrysopetalum hernancortezae*: A, Anterior end, dorsal view; B, Same, ventral view; C, Same, left parts of first 3 segments removed, except for ventral cirrus of segment 1; D, Anterior 3 segments, left side, removed from C above, slightly turned ventral view; E, Same, dorsal view; F, Left parapodium, middle segment, anterior view; G, Same, right side, posterior view, tips of paleae omitted; H, Tip of right notopodium with dorsal cirrus, posterior view (A, C-G, USNM 97354; B, USNM 97351; H, IRCZM 50:993).

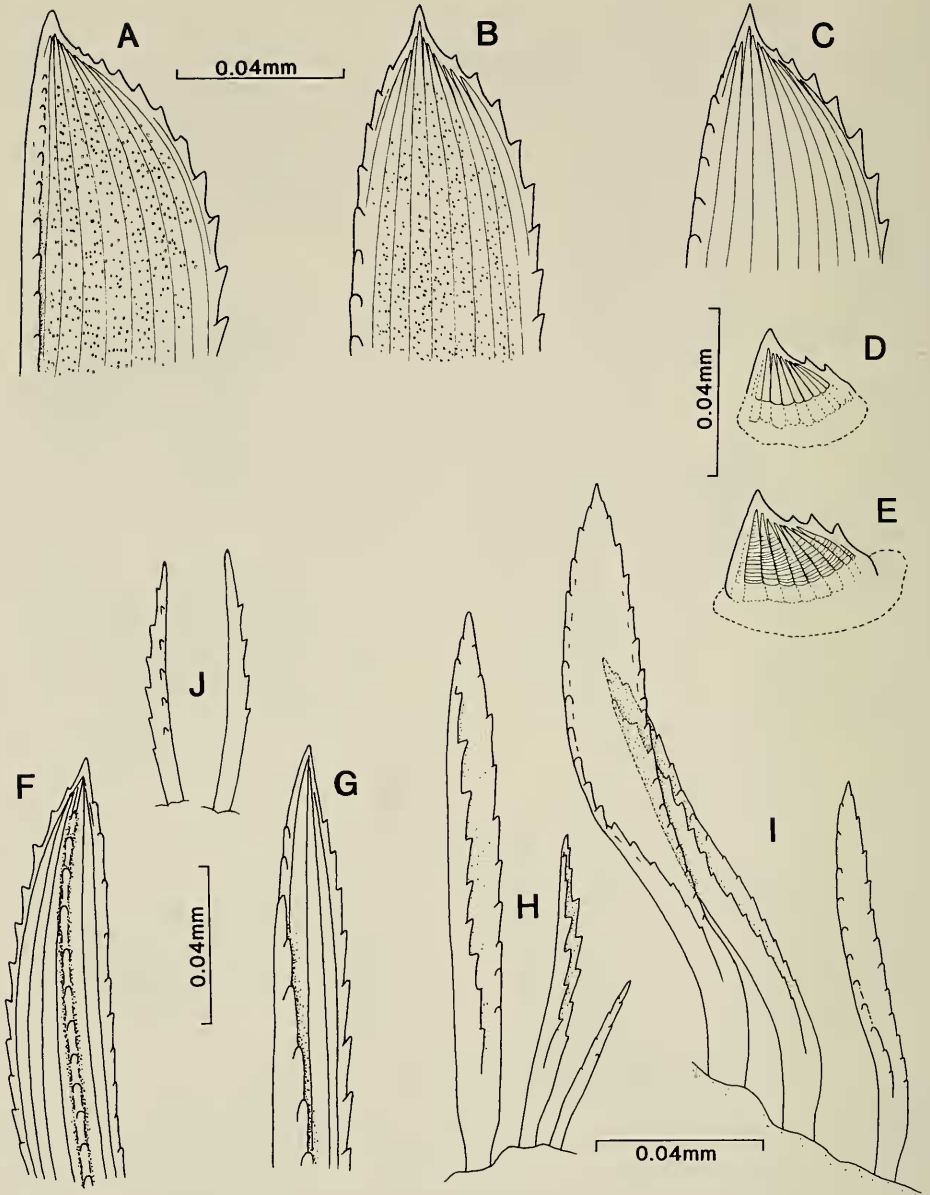


Fig. 12. *Chrysopetalum hernancortezae*, notosetae, middle segments: A, Tip of palea, from lateral part of middle group; B, C, Same, from central part; D, E, Newly forming paleae, posterior side of middle group; F, Palea, midline group; G, Palea, lateral group; H, Small paleae and spine, lateral group, left notopodium; I, Paleae, anterior group, right notopodium, large one near midline paleae; J, Spines, anterior group (A, D, E, H, FSBC I 31328; B, C, F, G, USNM 97354; I, FSBC I 31329).

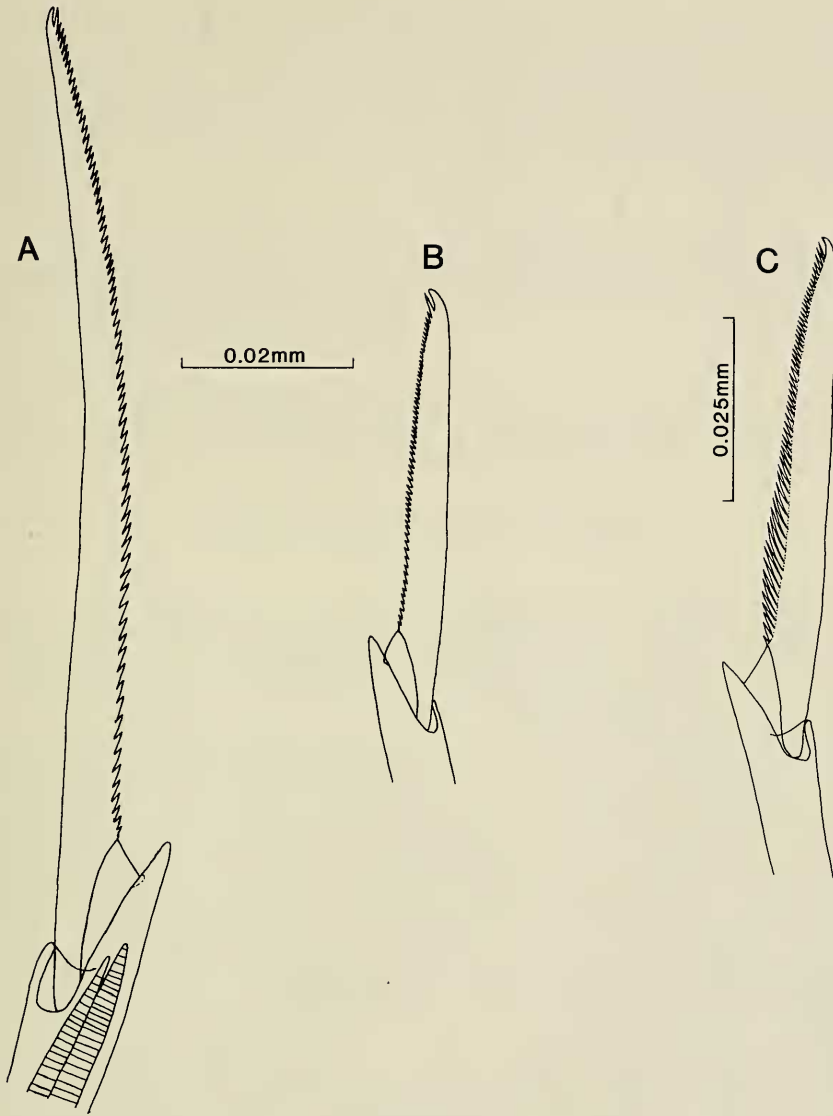


Fig. 13. *Chrysopetalum hernancortezae*, neurosetae, middle segments: A, Upper compound falciger; B, Lower compound falciger; C, Middle compound falciger (A, B, IRCZM 50:993; C, USNM 97354).

segments numbering 20–31; long, symmetrical ones in center of group with obtuse to acute tips; lateral and medial ones with acute tips; midline group paleae numbering about 6, with denticulate surface midrib; lateral group paleae numbering to about 7, all similar, slender, diminishing to spine anteromedially; anterior group setae consisting of few spines scattered across bundle in front of middle group paleae and 1–3 small, biserrate paleae near but usually slightly separated from triserrate ones of midline group. Blades of compound falcigers of middle



segments long (Fig. 13A–C), upper few distinctly longer than adjacent ones, gradually shorter below; serrations on upper blades short, coarse, finer on lower blades, long, fine on several blades in middle of bundle; distalmost serration of all blades long, extending about to tips. Interramal regions of middle parapodia (Fig. 11G) without glands containing spindles of fibers; gland in cirrophore of dorsal cirri as figured (Fig. 11H).

*Remarks.*—*Chrysopetalum hernancortezae* is similar to *C. elegans* Bush in having paleae without hoods or hood remnants. Paleae of *C. hernancortezae* are not as slender nor as pointed as those of *C. elegans*, and the large interramal glands containing spindles of fibers present in *C. elegans* do not occur in *C. hernancortezae*.

*Etymology.*—The species is named for the Florida Department of Natural Resources Research Vessel *Hernan Cortez*, used for collecting most of the specimens. The *Hernan Cortez* was retired in 1983 after almost 20 years of reliable service.

*Chrysopetalum heteropalea*, new species

Figs. 14, 15

*Material examined.*—FLORIDA (Gulf of Mexico): Hourglass Sta K, 51 nmi W of Sanibel Is. Light, 26°24'N, 82°58'W, 37 m, holotype (USNM 97357). FLORIDA (Atlantic): Dade County, S. Biscayne Bay, DERM Sta 16, Ragged Keys, at edge of channel between 2 Keys, 25°32'01"N, 80°10'17"W, 2–3 m, scoured hard bottom, paratype (USNM 97358).

*Description.*—Holotype anterior fragment 1.08 mm long, 0.47 mm wide without setae, 15 segments; paratype anterior and middle fragments, 1.2 mm long, 0.2 mm wide, 16 segments. Prostomium (Fig. 14A, C) wider than long, anterior margin partly turned ventrally and facing anterodorsally; eyes in rectangular arrangement, anterior ones only slightly larger than posterior ones and well separated from each other; median antenna slender, fusiform; lateral antennae attached on anterior margin just above origins of palps; palps about twice longer than wide. Caruncle rounded, cilia on margin not observed. Mouth covering (Fig. 14B) semioval, extending from anterior margin of segment 5. Notosetae only paleae (Figs. 14D, 15A–G), with tips hooded, entire; dorsal surface ornamented with numerous irregular, transverse ridges; ridges about half as numerous as internal cross-ribs; middle group paleae of middle segments about 22, longer symmetrical ones in center of group with obtuse tips, with 8 longitudinal ribs, lateral and medial ones with pointed tips hardly exceeding convex margins; midline group paleae about 5, with denticulate surface midrib; lateral group paleae consisting of 2 longer, broader, symmetrically and acutely tipped ones originating medially (nearest aciculum) and 2 more slender, shorter ones originating laterally. No anterior group notosetae. Blades of compound falcigers relatively short (Fig. 14F–I), upper few not distinctly longer than adjacent ones, gradually shorter below; 1–2 lowest blades very slender; serrations on upper blades short, coarse; long, stout on several blades in middle of bundle; fine, moderately long on blades near lower part of bundle; very fine, short on lowest 1–2 blades. Interramal region of middle parapodia ciliate on anterior side, without glands containing spindles of fibers (Fig. 14E).

*Remarks.*—*Chrysopetalum heteropalea* differs from other species of the genus

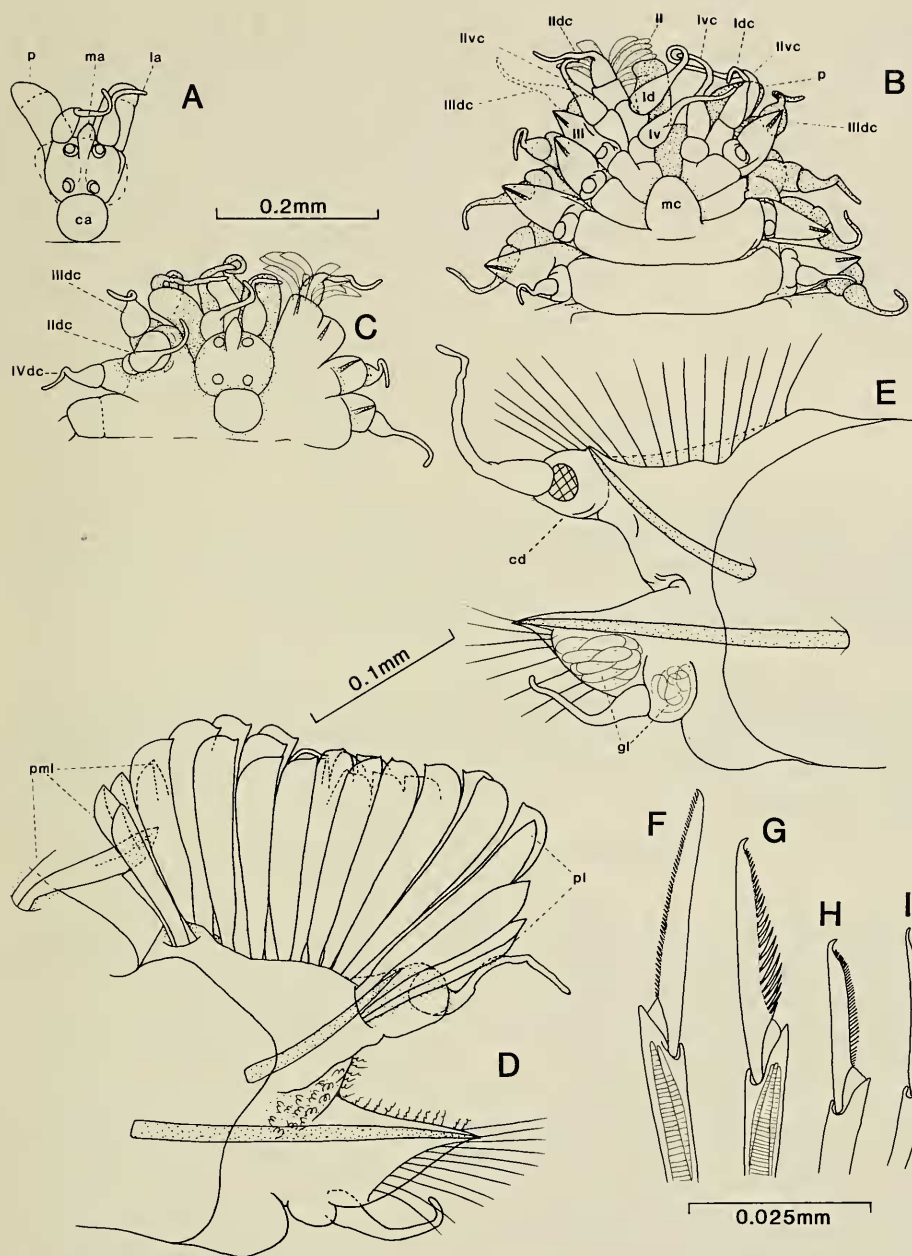


Fig. 14. *Chrysopetalum heteropalea*, holotype: A, Prostomium, dorsal view; B, Anterior end, ventral view; C, Same, dorsal view; D, Right parapodium, middle segment, anterior view; E, Same, posterior view, tips of setae omitted; F, Upper compound falciger; G, Middle compound falciger; H, Lower compound falciger; I, Lowest compound falciger.

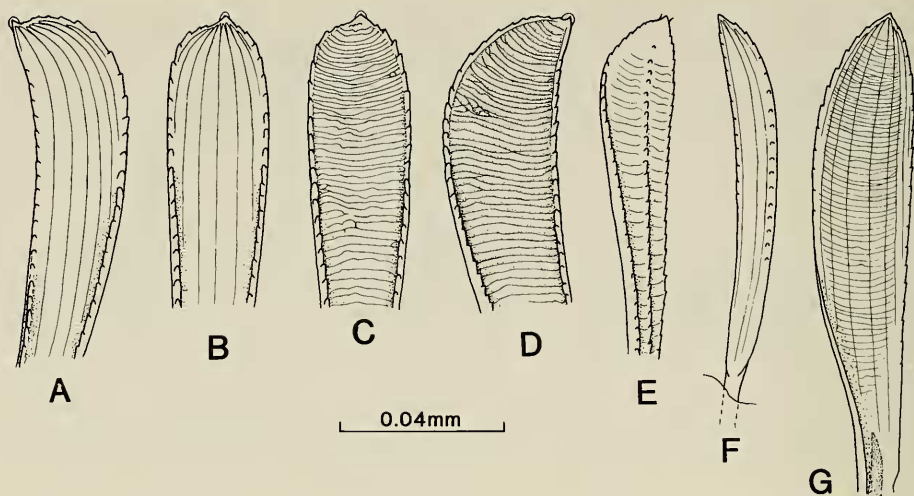


Fig. 15. *Chrysopetalum heteropalea*, notosetae, middle segments, holotype: A, Lateral palea, middle group of right notopodium; B, Same, central palea; C, Same, showing surface ornamentation; D, Same, from near midline; E, Palea, midline group, showing remnants of hood on tip; F, Small palea, lateral group; G, Large palea, lateral group, showing tip of aciculum at base.

by having palea ornamented with transverse ridges rather than knobs and by lacking spines or paleae in an anterior group on notopodia of middle segments.

*Etymology.*—The specific name is derived from the Greek *heteros*, different, and the Latin *palea*, scale, and refers to the unique paleae of the species.

*Chrysopetalum floridanum*, new species

Figs. 16, 17, 18A–C

*Material examined.*—FLORIDA (Atlantic): Palm Beach-Broward County line S of Boca Raton, on *Phragmatopoma*, 1.3 m, 5 specimens (FSBC I 31377; H. Rudolph).—Dade County, S Biscayne Bay, DERM Sta 16, Ragged Keys, near channel between 2 Keys, 25°32'01"N, 80°10'17"W, scoured hard bottom, 2–3 m, holotype (USNM 97359), 16 paratypes (USNM 97360, 97361; AHF Poly 1433, ZMH P-18227; FSBC I 31378), 8 specimens (DERM).—Same, Sta 20, SW of Soldier Key, attached algae including *Halimeda*, 25°34'13"N, 80°11'27"W, 9 specimens (DERM).—Same, Sta 23, SW of Cape Florida, 25°37'56"N, 80°13'23"W, 3–4 m, *Thalassia*, 1 paratype (YPM), 1 specimen (DERM).—Same, Sta 24, SW of Cape Florida at W edge of shoal in Biscayne Flats-Safety Valve area, 25°38'37"N, 80°11'27"W, 2 paratypes (ZMC).—Same, N Biscayne Bay, Sta 47, middle of Julia Tuttle Causeway-79th Street Causeway Basin, 25°49'32"N, 80°09'25"W, 1 m, thick *Halimeda* with *Syringodium*, 1 paratype (BMNH ZB 1984.59).—Florida Keys (Monroe County): exact location and depth unknown, colls. DER personnel, 1 specimen (FSBC I 31379).—Looe Key National Marine Sanctuary, reef crest, coralline covered rubble, less than 1 m, Sta FLK-2, 1 specimen (USNM 95727).—Same, clumps of *Halimeda*, Sta FLK-6, 2 specimens (USNM 97528).—Same, at base of upper spur and groove buttress, coral rubble, 6+ m, Sta FLK-25, 1

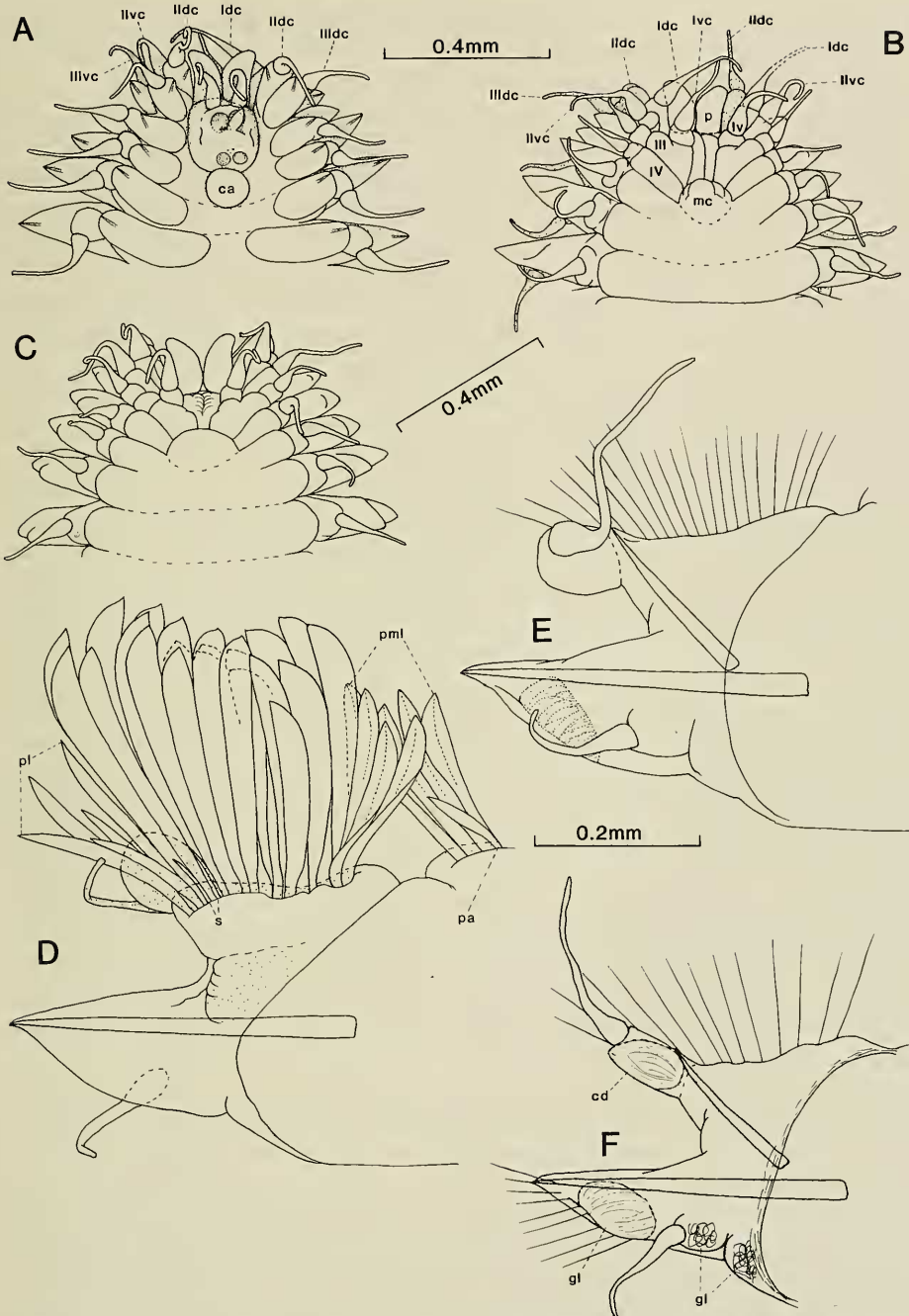


Fig. 16. *Chrysopetalum floridanum*: A, Anterior end, dorsal view; B, C, Same, ventral view; D, Left parapodium, and midline and anterior group paleae of right side middle segment, anterior view; E, F, Same, right side, posterior view, tips of paleae omitted (A, B, holotype; C, USNM 97360; D, E, USNM 97361; F, FSBC I 31377).



specimen (USNM 97529). BAHAMA ISLANDS: Hydro-Lab, 1.2 nmi off Bell Channel, Lucaya, Grand Bahama Is., 26°33'N, 78°34'W, 15–30 m, colls. M. Wells et al., 3–15 Apr 1974, 1 specimen (FSBC I 31380).

*Description.*—Holotype consisting of anterior fragment 7 mm long, 1 mm wide without setae, 35 segments; largest specimen (BMNH ZB 1984.59) consisting of anterior and middle fragments perhaps 10 mm long, 1.3 mm wide, 48 segments; largest complete specimen (FSBC I 31378) immature, 5.5–6 mm long, 40 segments, parallel-sided after first few segments, tapered near posterior end. Prostomium (Fig. 16A) turned anteriorly only slightly or to about 45° angle, anterior eyes at least partly visible near anterior end, facing dorsally or anterodorsally, circular, touching only at middle, appearing separated; surface of prostomium rarely infolded and anterior eyes tending to appear oval and closely appressed; posterior eyes near posterior margin, circular; median antenna originating dorsally or near anterior margin, directed dorsally or anterodorsally; lateral antennae usually completely visible in dorsal view; caruncle covering only small part of posterior end of prostomium; palps originating ventrally near anterior margin of prostomium (Fig. 16B, C). Notosetae consisting of paleae and spines (Figs. 16D, 17A–I, 18A–C). Tips of paleae entire, with remnants of hoods on middle group, dorsal surface moderately to strongly knobbed. Middle group paleae of middle segments (Figs. 16D, 17A–C, 18A–C) 25–33; longer symmetrical ones in middle of group with obtuse tips and 8–10 internal ribs; anterior (older) paleae much shorter than posterior (later formed) paleae. Midline group paleae (Figs. 16D, 17D) about 5, with denticulate surface midrib, without remnant of hood on tip. Lateral group paleae (Fig. 17E, F) about 8, slender, decreasing to spine anteromedially. Full complement of anterior group notosetae (Figs. 16D, 17G–I) consisting of 2 spines equally spaced near lateral group spine and directed somewhat medially with respect to middle paleae, 1 more medial spine directed somewhat laterally, and 1 slender and 1 broader and longer, biserrate palea near midline group paleae; various forms often absent and full complement seldom present. Blades of compound falcigers (Fig. 17J–L) moderately long, upper few distinctly longer than adjacent ones, gradually shorter below, each with distal serration long, extending to near falcate tip. Interramal regions on anterior side of parapodia ciliate, without glands containing spindles of fibers (Fig. 16D); other parapodial glands as figured (Fig. 16E, F).

*Remarks.*—*Chrysopetalum floridanum* is very similar to *C. occidentale* from southern California to Panama. The prostomium of mature *C. occidentale* is turned forward so that the anterior eyes face anteriorly, possibly slightly ventrally, and the median antenna is directed anteriorly. Anterior eyes of *C. occidentale* are oval, closely appressed and visible from the dorsum only through the anterior part of the prostomium. Distal serrations of blades of falcigers of *C. occidentale* do not extend to near falcate tips. On mature specimens of *C. floridanum*, the prostomium is usually dorsally directed with both pairs of eyes visible and with the median antenna directed dorsally or anterodorsally. Anterior eyes are circular, although touching, but not closely appressed, except on a specimen on which the prostomium is infolded dorsomedially. Distal serrations of blades of falcigers of *C. floridanum* are long and extend to near falcate tips. The prostomium seems to be turned more forward on a few small, immature specimens of *C. occidentale*,

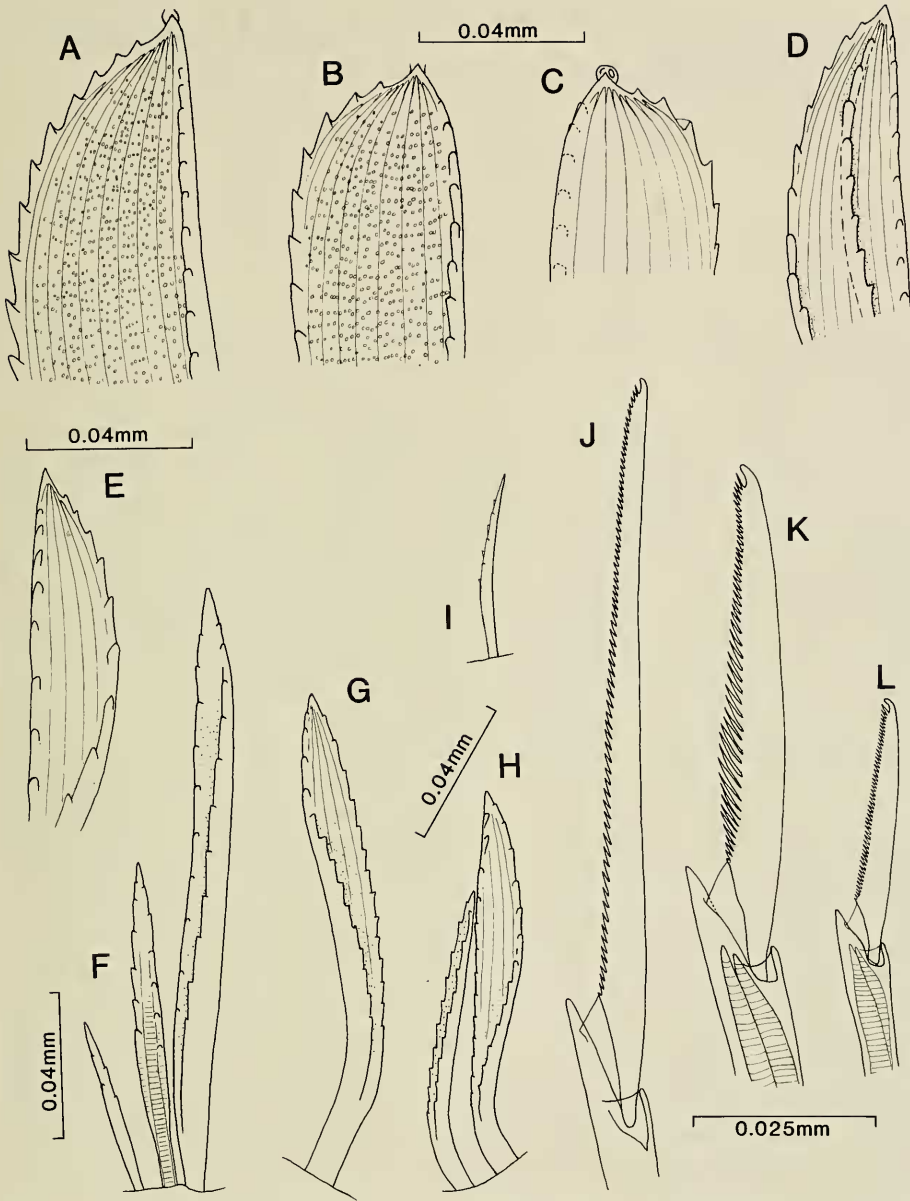


Fig. 17. *Chrysopetalum floridanum*, setae of middle segments: A, Lateral palea of middle group, showing remnants of hood and surface ornamentation; B, Same, central palea; C, Same, newly emerging palea, with entire hood, posterior view; D, Palea, midline group; E, Palea, lateral group; F, Small paleae and spine, lateral group of right notopodium; G, Palea, anterior group, in front of central paleae of middle group; H, Paleae, anterior group, in front of medial paleae of middle group; I, Spine, anterior group; J, Upper compound falciger; K, Middle compound falciger; L, Lower compound falciger (A-C, USNM 97361; D, E, J-L, ZMC; F, G, BMNH ZB 1984.59; H, I, DERM Collection).

so this character should be used with caution. The arrangement of anterior notosetae of middle segments is the same for both species, but various forms of these setae are more often absent on *C. floridanum*.

*Chrysopetalum eurypalea*, new species

Figs. 18D–I, 19, 20

*Material examined.*—FLORIDA KEYS (Monroe County): Looe Key National Marine Sanctuary, pockets of rubble at base of buttress in spur and groove zone, 6+ m, Sta FLK-15, holotype (USNM 97585).

*Description.*—Holotype mature male, 3.8 mm long, 1.1 mm wide without setae, 27 segments including 4 segments on regenerating posterior end; palea opalescent. Prostomium (Fig. 18D, E) wider than long, anterior margin turned slightly ventrally and facing anterodorsally; eyes in rectangular arrangement, anterior ones larger than posterior ones, circular, touching each other, visible from dorsum below median antenna, directed anterodorsally; posterior eyes at about middle of posterior half of prostomium, separated; median antenna attached dorsally back from anterior margin, directed anterodorsally, pyriform; lateral antennae attached on anterior margin just above origins of palps, completely visible from dorsum; palps about twice longer than wide. Caruncle overlying small part of posterior margin of prostomium. Mouth cover (Fig. 18E) extending from anterior margin of segment 5, semioval. Notosetae consisting of paleae and spines (Figs. 18F–I, 19A, C, D); paleae with tips entire, perhaps with short, persistent hoods, dorsal surface lightly to moderately knobbed. Middle group paleae of middle segments about 24, longer symmetrical ones in center of group relatively broad with almost blunt, obtuse tips, with 12 slender internal longitudinal ribs; long lateral and medial paleae with pointed tips only slightly exceeding convex margins, with 11–12 internal ribs; shorter anterior middle group paleae more slender and pointed, less distinctly ornamented, with fewer internal ribs. Midline group paleae (Fig. 20C) about 6, with surface midribs. Lateral group paleae (Fig. 20D) about 6, slender, decreasing to spine anteromedially, with remnants of hoods. Anterior group notosetae (Figs. 19A, 20E–G) consisting of 2 spines and single slender biserrate palea near medial palea of middle group. Blades of compound falcigers of middle segments (Fig. 20H–K) of moderate length, upper few distinctly longer than adjacent ones, gradually shorter below, each with distal serration extending to near falcate tip; upper few with short, stout serrations; some middle ones with moderately long serrations, others shorter; lower ones with short, fine serrations. Interramal region of middle parapodia (Fig. 19A, B) ciliate, without gland containing spindles of fibers.

*Remarks.*—*Chrysopetalum eurypalea* differs from the other *Chrysopetalum* species with knobbed paleae in having relatively broader and more bluntly-tipped middle group paleae, with the longer, posterior ones having more internal ribs. Internal ribs of longer palea of *C. eurypalea* are relatively narrow and number 11–12 near the tips (Fig. 18F–I). Such paleae on most other species are relatively more slender with usually broader ribs numbering up to 10 near the tips. Long middle group palea of *C. eurypalea* are shaped like those of *C. heteropalea*, but have a different type of surface ornamentation.

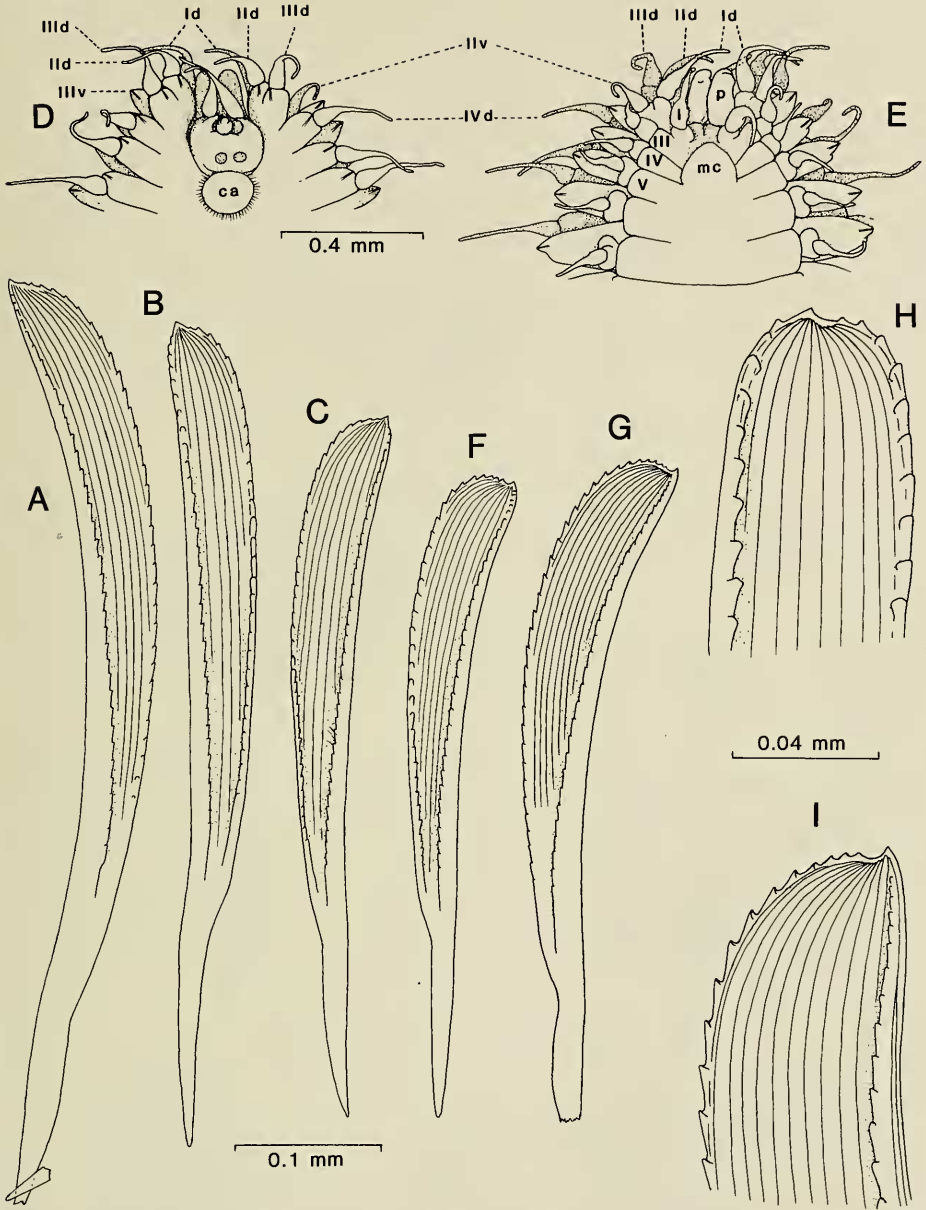


Fig. 18. *Chrysopetalum floridanum*, long, broad middle group paleae of middle segments; A, From lateral part; B, C, From central part (A, B, BMNH ZB 1984.59; C, From holotype lot, USNM 97359-97360). *Chrysopetalum eurypalea*, holotype: D, Anterior end, dorsal view; E, Same, ventral view; F, Central, long, posterior middle group palea, segment 17; G, Same, from lateral part; H, Tip of central, long, broad middle group palea, segment 18; I, Same, from lateral part.



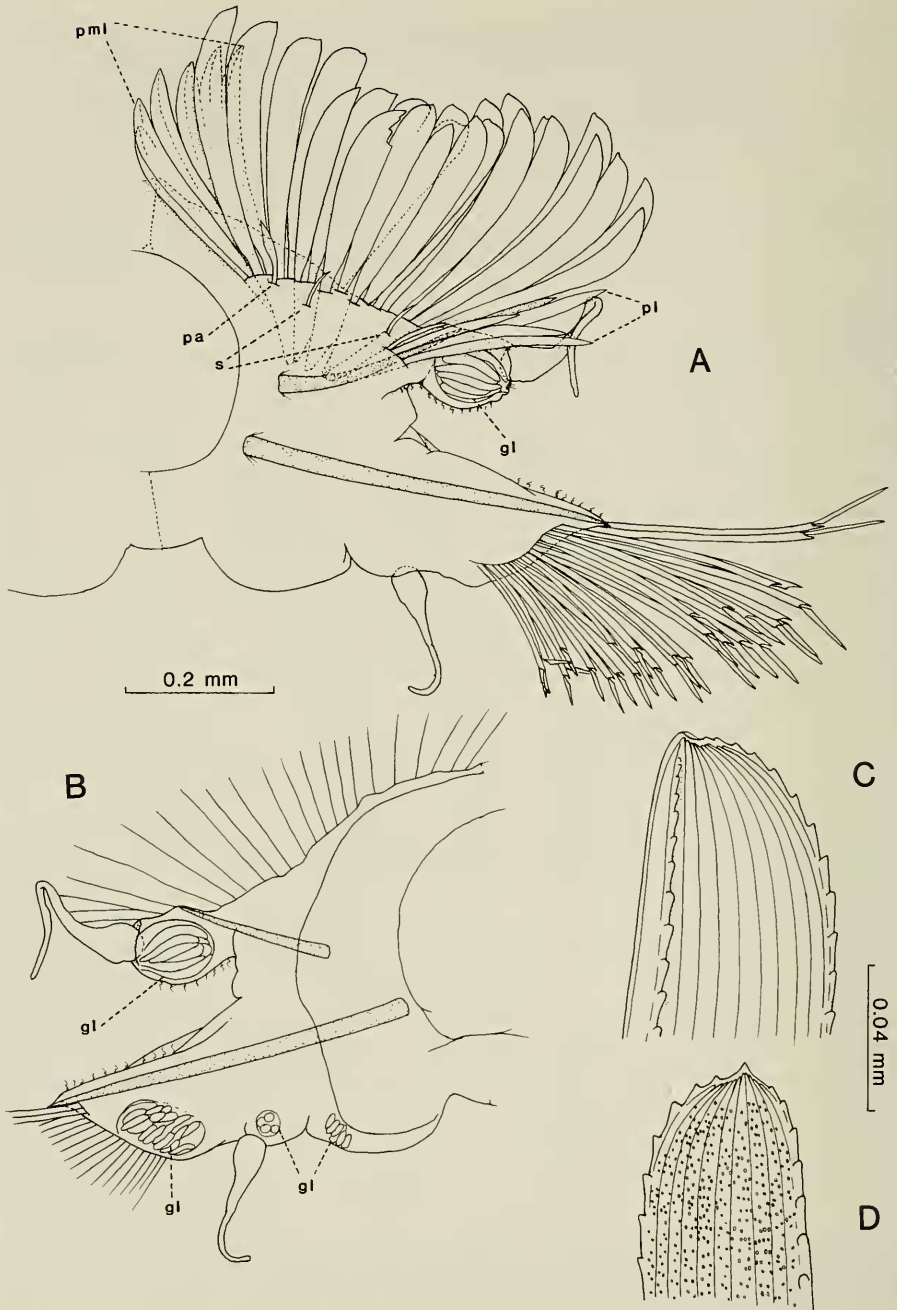


Fig. 19. *Chrysopetalum eurypalea*, segments 17 and 18 of holotype: A, Parapodium, right side, anterior view; B, Same, posterior view, tips of setae omitted; C, Tip of medial, long, broad, middle group palea; D, Tip of central anterior middle group palea.

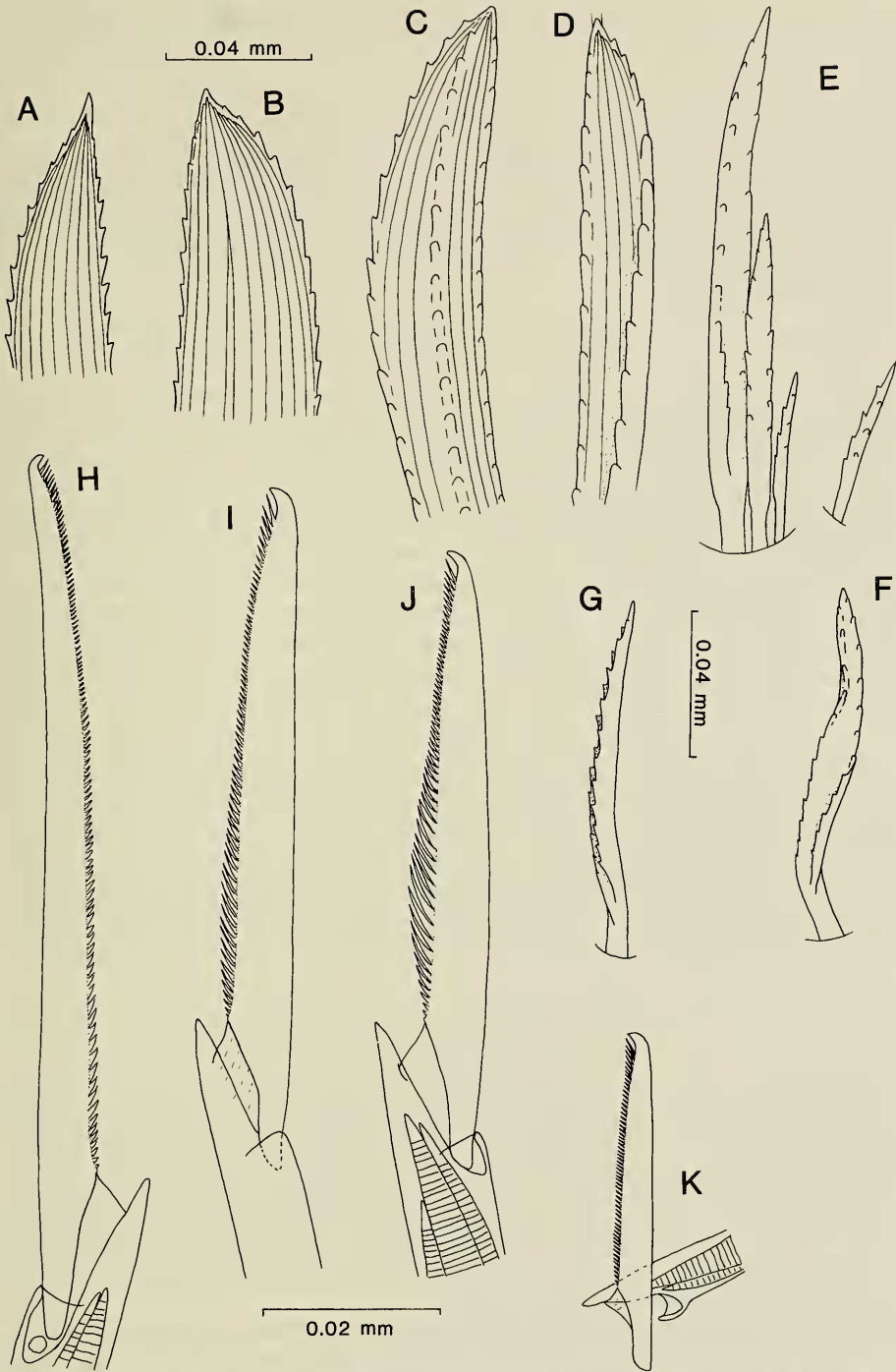


Fig. 20. *Chrysopetalum eurypalea*, segments 17 and 18 of holotype: A, Slender, anterior middle group palea, from extreme lateral part; B, Same, from near medial part; C, Midline group palea; D, Lateral group palea; E, Small lateral group paleae and spine, and adjacent anterior group spine, left notopodium; F, G, Anterior group paleae; H, Upper compound falciger; I, J, Middle compound falciger; K, Lower compound falciger.

*Etymology.*—The specific name is derived from the Greek *eurys*, broad, and the Latin *palea*, scale, and refers to the shape of middle group paleae of the species.

*Bhawania* Schmarda, 1861

*Bhawania* Schmarda, 1861:164.—Ehlers, 1864:80.—Quatrefages, 1866a:297, 298.—Horst, 1917:136, 137.—Augener, 1918:98–103.—Fauvel, 1932:42; 1936a:16; 1953a:79.—not Jorge, 1953:103.—Rullier, 1964:142.—not Katzmann, Laubier, and Ramos, 1974:313–317.—Day, 1967:117, 118.—Fauchald 1977a:72.  
*Psectra* Grube, 1868:51.

*Type-species.*—*Bhawania myrialepis* Schmarda, 1861; by monotypy.

*Diagnosis.*—Body long, slender. Prostomium retractile within anterior segments, apparently fused laterally with anterior segments; eyes 2 pairs; antennae similar, median antenna originating in front of eyes; caruncle absent; palps oval; mouth opening broad, on anterior margin of segment 3 or 4. Segments 1 and 2 with 3 pairs of cirri. Parapodia biramous, beginning on segment 2; each with very broad notopodial lobe extending laterally about as far as neuropodial lobe, 3 groups of notopodial paleae, compound neuropodial spinigers on anterior few segments, changing to spinigers above and falcigers below on middle and posterior segments. Notopodia with dorsal cirri retractile into cirrophore. Neuropodia with ventral cirri on short cirrophores below setae, similar to dorsal cirri. Paleae slender on segment 2–3, typically beginning on segments 3–5, usually completely covering dorsum, forming smooth surface, extending from bundles occupying greater than  $\frac{2}{3}$  segmental width. Middle group paleae (pm) of middle segments produced separately, forming single, imbricated row; paleae broad, similar, symmetrically tipped, with 20–25 internal ribs, cross-bars not extending completely to tip, dorsal surface including lateral margins ornamented with 5 or more raised, denticulate ribs. Lateral group paleae (pl) short, slender, thin, pointed. Midline group paleae (pml) thin, paddle-shaped, in longitudinal row diminishing anteriorly, usually overlain by medial paleae of middle group. Pygidium bulbous, with 3 anal cirri.

*Remarks.*—*Chrysopetalum riveti* Gravier, 1908 (Gravier, 1909:638–641, pl. 17, figs. 31–34), from Peru and Panama, referred to *Bhawania* by Augener (1913:79), and *Paleanotus purpurea* Rioja, 1947, from Baja California, may form a different generic group. The two species have notopodia and paleae resembling those of typical *Bhawania* species. However, paleae apparently do not cover the dorsum on the anterior end; there are three types of neurosetae consisting of an upper group of spinigers, a middle group of stout falcigers and a lower group of much more slender falcigers; and the prostomium apparently resembles that of *Paleanotus* (Rioja, 1947). Similar neurosetae have been described on specimens of *Bhawania* from Indo-West Pacific areas (*Bhawania cryptocephala pottsiana* Horst, 1917; *B. cryptocephala*.—Fauvel, 1932, not Gravier, 1901; *B. goodei*.—Imajima and Hartman, 1964, not Webster, 1884).

*Bhawania multisetosa* Hartmann-Schröder, 1981, from Australia, appears to be similar to *Chrysopetalum* Ehlers in most characters; however, Hartmann-Schröder stated that there were only three pairs of cirri on the first two segments and that the median antenna originated in front of the anterior pair of eyes, characters differing from those of *Chrysopetalum*. Surface ornamentation of pa-

leae consists of irregular longitudinal ridges with humps or bumps aligned with about 12 internal ribs.

*Bhawania brunnea* Morgado and Amaral, 1981, from Brazil, differs from typical *Bhawania* species in apparently having blades of neurosetae which gradually decrease in length from spinigers above to falcigers below. Morgado and Amaral also described subulate palps for *B. brunnea*. Day (1967, fig. 2.1b, b') illustrated subulate palps for South African specimens he referred to *B. goodei* Webster, but these may actually be cirri. Schmarda's original figure of a ventral view of the anterior end of *B. myrialepis* (Schmarda, 1861, pl. 37, fig. 324) shows two pairs of appendages which appear to be palps and styles of ventral cirri of segment 1. The "palps" of *B. myrialepis* are similar to the broadly oval ones of the two species examined.

Characters of generic importance include the following: specimen size; number, proportions and surface ornamentation (including the number of surface ribs and the type of ornamentation between them) of the paleae of the three groups; types and detail of neurosetae including the character of change between upper ones and lower ones; color of the paleae; and degree of retractility of the prostomium and dorsal cirri. The darkness of the color of the paleae seems to be related to their thickness. This character and that of the degree of retraction of the prostomium and cirri of preserved specimens should be used with caution. Tips of paleae seem to be fragile and easily damaged, so determination of whether a palea of the middle group comes to a small point on some species might not be certain.

#### Key to Floridan species of *Bhawania*

1. Paleae of middle group up to 15, thin, with narrow surface ribs and distinct hyaline tips (Fig. 24A–D); slender lateral group paleae up to 5 (Fig. 24A) ..... *B. heteroseta* (Hartman)
- Paleae of middle group up to 26, thick, with broad medial and narrow lateral surface ribs and indistinct hyaline tips (Fig. 21E, F, 22A); slender lateral group paleae up to about 20 (Fig. 21E) ..... *B. goodei* Webster

#### *Bhawania goodei* Webster, 1884

Figs. 21, 22

*Bhawania goodei* Webster, 1884:308, 309, pl. 7, figs. 10–15.—Treadwell, 1901: 195.—Augener, 1924:51 [list]; 1927:41, 42.—?Monro, 1933:18, 19.—Carpenter, 1956:99.—Fauvel, 1953b:5.—Rioja, 1959:221, 222.—McCloskey, 1970:24, 25.—Day, 1973:14.—Gardiner, 1976:100, fig. 5 a–e.—Fauchald, 1977b:10 [at least Atlantic specimens].

*Palmyra goodei*.—Treadwell, 1939:199, 200, fig. 29.

*Paleanotus heteroseta*.—Taylor, 1961:61, pl. 1, fig. 2 [not Hartman, 1945].

*Material examined*.—BERMUDA: 3 + syntypes (USNM 4783). FLORIDA (Atlantic): Hutchinson Island Sta 2, 27°21.6'N, 80°13.2'W, 11 m, coarse calcareous sand, 2 specimens (USNM 54225; FSBC I 31265).—Same, Sta 5, 27°22.9'N, 80°13.9'W, 11 m, coarse calcareous sand, fragment (FSBC I 31266).—On *Oculina*, Fort Pierce, off Pepper State Park, 27°29.6'N, 80°17.3'W, 5–7 m, 7 specimens



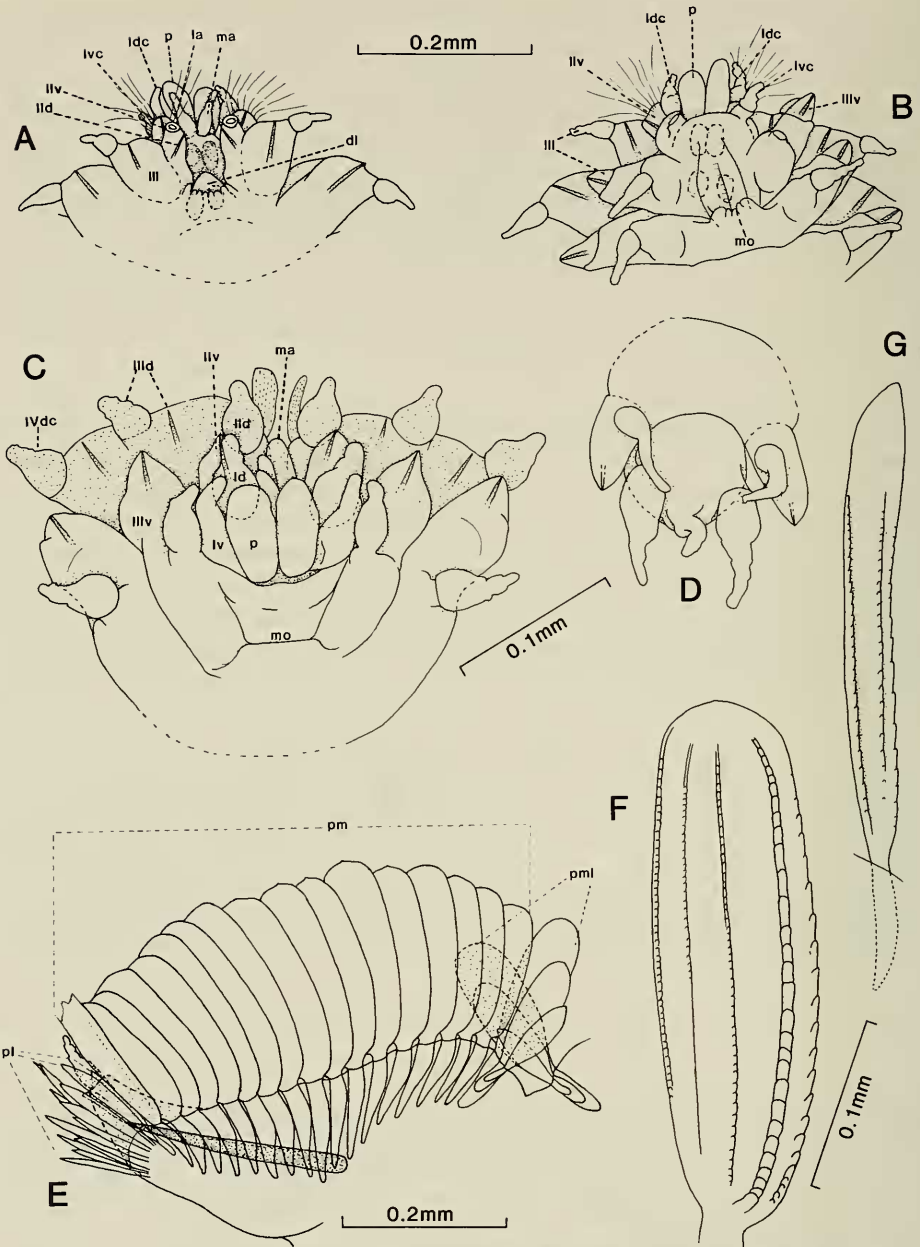


Fig. 21. *Bhawania goodei*: A, Anterior end, dorsal view, large, extended specimen; B, Same, ventral view; C, Anterior end, ventral view, small specimen [ma = ?dl]; D, Pygidium, ventral view; E, Left notopodium of middle segment, anterior view; F, large palea, middle group of left notopodium; G, Slender lateral palea, middle group of same (A, B, D, E, YPM; C, FSBC I 31265; F, G, FSBC I 31271).

(USNM 96363; IRCZM 50:998, 50:999; YPM; AHF).—Same, off St. Lucie Inlet, 42–44 m, 27°10'N, 80°00'W (Area G of Reed, 1980, fig. 1) 2 specimens, 2 fragments (FSBC I 31267; IRCZM 50:997, 1000, 1001).—Same, ENE of Fort Pierce, 27°32.8'N, 79°58.8'W, 77–80 m (Jeffs Reef, Area A, Reed, 1980, fig. 1) 2 specimens (IRCZM 50:1002; USNM 97364).—Off Palm Beach-Broward County Line S of Boca Raton, 1.3 m, on *Phragmatopoma*, 13 specimens (USNM 97362; BMNH ZB 1984.60–62; ZMH P-18230; YPM; FSBC I 31268; H. D. Rudolph).—Biscayne Bay at R. L. Turchin Marina, shell hash, 2.7 m, colls. DER personnel, May 1978, 1 specimen (YPM).—Dade County, DERM collection, N Biscayne Bay, 4 specimens (FSBC I 31269; DERM). Same, S Biscayne Bay, 5 specimens (DERM).—Same, Card Sound, 1 specimen (DERM). FLORIDA (Gulf of Mexico): Hourglass Sta I, 4 nmi W of Sanibel Is. Light, 26°24'N, 82°06'W, 6 m, 1 specimen (FSBC I 31280).—Same, Sta J, 24 nmi W of Sanibel Is. Light, 26°24'N, 82°28'W, 18 m, 9 specimens (FSBC I 31281–31286).—Same, Sta B, 19 nmi W of Egmont Key, 27°37'N, 83°07'W, 18 m, 12 specimens (FSBC I 31270–31279).—Seahorse Key, Levy County, on sponge, coll. T. Hopkins, Sep 1960, 1 specimen (USNM 32383). PUERTO RICO: Arroyo, USFC Str. *Fish Hawk*, 3 Feb 1899, 1 specimen (USNM 15953). PANAMA (ATLANTIC): Galeta Reef, coll. A. Reimer, 2 Oct 1970, 1 specimen (USNM 61629).

*Description.*—Paleae golden-brown on large specimens to golden-yellow on small specimens, iridescent, completely covering dorsum and forming smooth surface. Pigmented glandular areas on lower lateral parts of notopodia and on ventrum between neuropodia and longitudinal muscle bands. Largest specimen 50 mm long, 3 mm wide (Webster 1884); North Carolina specimens up to 30 mm long, 2 mm wide (Gardiner 1976); largest Florida specimen somewhat contracted, 28 mm long, about 2.5 mm wide, 153 segments; smallest specimen 1.3 mm long, broadly oval in outline, 0.7 mm wide, about 20 segments (FSBC I 31269). Body flattened, with short segments much broader than height, broadly convex dorsally, flat ventrally. Prostomium and first 1 or 2 segments usually retracted within anterior segments and under conical lobe (dl) extending from anterior margin of segment 3, with prostomium and antennae seldom visible dorsally or ventrally on large specimens; partly visible on one large specimen (Fig. 21A, B); antennae often visible ventrally on small, contracted specimens (Fig. 21C). Median antenna shorter than lateral antennae, with origin in front of anterior pair of eyes not confirmed; anterior eyes appressed, elongate; posterior ones more rounded; palps oval, twice longer than wide; mouth opening near anterior margin of segment 4 of large extended specimen (Fig. 21B), appearing on segment 3 of small, contracted specimen (Fig. 21C), perhaps changing during development. Cirri of segments 1 and 2 stouter than antennae, shorter than dorsal cirri of middle segments. Notopodia of middle segments (Fig. 21E) each with stout aciculum and slender aciculum (not shown), with 2–3 midline group paleae in longitudinally-arranged group, 10–26 middle group paleae in long, imbricated, transverse row, and up to about 20 slender paleae and 1–2 broader paleae in lateral group. Midline group paleae (Figs. 21E, 22B, C) covered by medial paleae of middle group, thin, with 10–17 internal ribs; anterior one small, but half as long, less than half as wide as adjacent palea of middle group; posterior one about as long and broad as adjacent palea of middle group; anterior dorsal surface convex, with 2–3 surface midribs,

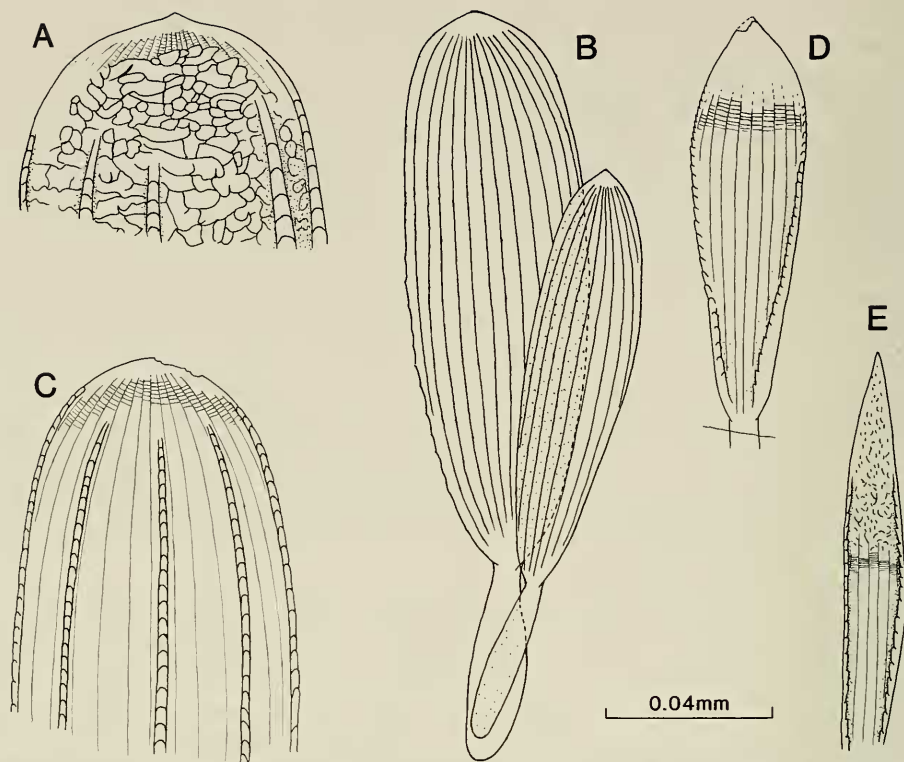


Fig. 22. *Bhawania goodei*, paleae of middle segments: A, Tip of large palea, middle group of left notopodium, showing surface ornamentation and surface ribs; B, Small paleae, midline group; C, Large palea, midline group, showing surface ribs, internal ribs and distal cross-bars; D, Broad palea, lateral group; E, Slender palea, lateral group (A, B, E, YPM; C, FSBC I 31271; D, FSBC I 31272).

with indistinct serrations visible on ribs and lateral margins, with surface ornamentation not as distinct but similar to that of middle group paleae. Middle group paleae, except for lateral one, all similar (Figs. 21F, 22A), each thick, broad, almost straight-sided, blunt-tipped, often with slight point, slightly bent laterally, with about 20 internal ribs having cross-bars extending almost to tip, with pair of lateral and 3 dorsal, surface ribs, with broad serrations on ribs extending to near tip, with ornamentation between surface ribs consisting of prominent, irregular, reticulate ridges; ornamentation extending distally beyond surface ribs but not as far as cross-bars of internal ribs; exposed medial margin and adjacent serrate rib strongly developed, usually visible under dissecting microscope; remaining 2 ribs and lateral margin covered by adjacent, more lateral paleae, with serrations half length and width of those of 2 medial rows. Lateral palea of middle group (Fig. 21G) longer, about half as wide as adjacent middle group palea, with about 11 internal ribs extending to near tip, with tip usually frayed, with pair of marginal and single surface denticulate ribs, latter near medial margin; surface ornamentation of distal part similar to that of lateral paleae; ornamentation similar to that of other middle group paleae proximally. Lateral group paleae up to 20, of 2 types; all serrate only on margins with surface ornamentation consisting of



short, irregular, unconnected bars or bumps and with internal ribs ending well back from tips. First type lateral group paleae 1–2, adjacent to lateral, triserrate palea of middle group (Fig. 22D) almost as wide and as stout as latter but shorter, about as long as other lateral group paleae, with obtuse tip, with 10–12 internal ribs extending farther than those of other lateral group paleae. Other type lateral group paleae (Fig. 22E) fragile, easily broken, about half as wide as broad lateral palea, with 5–7 internal ribs extending for about half of emergent length, with acute tips. Neuropodia of middle segments with small group of compound spinigers above and more numerous compound falcigers below; falcigers with stout, unidentate blades; blades of some upper falcigers with very long serrations on margin (Gardiner 1976, fig. 5d). Pygidium (Fig. 21D) rounded, conical, with small midventral cirrus about size of ventral cirri of posterior segments and pair of much larger, ventrolateral cirri.

*Remarks.*—*Bhawania goodei* has been reported from world-wide tropical seas (Imajima and Hartman 1964:47, 386; Day 1967:119). Specimens from West Africa reported as *B. goodei* by Augener (1918:98–103) are apparently another species. The large palea figured by Augener (pl. 2, figs. 1, 2) has gradually rounded lateral margins and an almost semicircular but excavate tip, whereas such palea of typical *B. goodei* are almost parallel-sided and blunt-tipped. Paleae of *B. goodei* often have an indistinct point, but I suspect that Augener's figure shows a palea with a broken tip. *Bhawania cryptocephala* Gravier, 1901, from Djibouti, Gulf of Aden, was referred to *B. goodei* by Day (1953:407). In my opinion, this synonymy is incorrect. Paleae of *B. cryptocephala* have a shape similar to that of the West African specimens of Augener (1918), but have very distinctly pointed tips and a surface ornamentation consisting of knobs, whereas surface ornamentation of paleae of *B. goodei* is very distinctly reticulate and similar but not as pronounced as that on paleae of *B. amboiensis* Horst, 1917. Specimens from Japan referred to *B. goodei* by Imajima and Hartman (1964:47) were apparently based on a report of *B. cryptocephala* of Fauvel (1936b:266) [not Gravier 1901]. The specimens apparently had ventrally originating neurosetae with slender, filiform appendages in addition to an upper group of spinigers and a middle group of short falcigers. Such slender, lower neurosetae are not present on *B. goodei*. The description of paleae of specimens from Pacific Panama and the Galapagos Islands reported as *B. goodei* by Monro (1933) suggests to me that his identification was correct; Fauchald (1977b:10) confirmed Monro's identification.

The species is known in the western Atlantic from Bermuda, the Caribbean area, the Gulf of Mexico, and the east coast of the United States from Florida to North Carolina, mostly on corals and rocky substrates, from intertidal to 80 m depths.

*Bhawania heteroseta* (Hartman, 1945), new combination  
Figs. 23–25

*Paleanotus heteroseta* Hartman, 1945:12, pl. 1, figs. 1–6.—Pearse and Williams, 1951:138 [identified by O. Hartman].—Wass, 1965:15.—Harper, 1971:20.—Taylor, 1971:119–123.—Day, 1973:14.—Gardiner 1976:100, fig. 5f–i.—Dauer et al., 1984:18.—Gathof, 1984:26–9, 26–10, figs. 26–7, 26–8.

*Material examined.*—FLORIDA (Atlantic): Hutchinson Island Sta 2, 27°21.6'N,



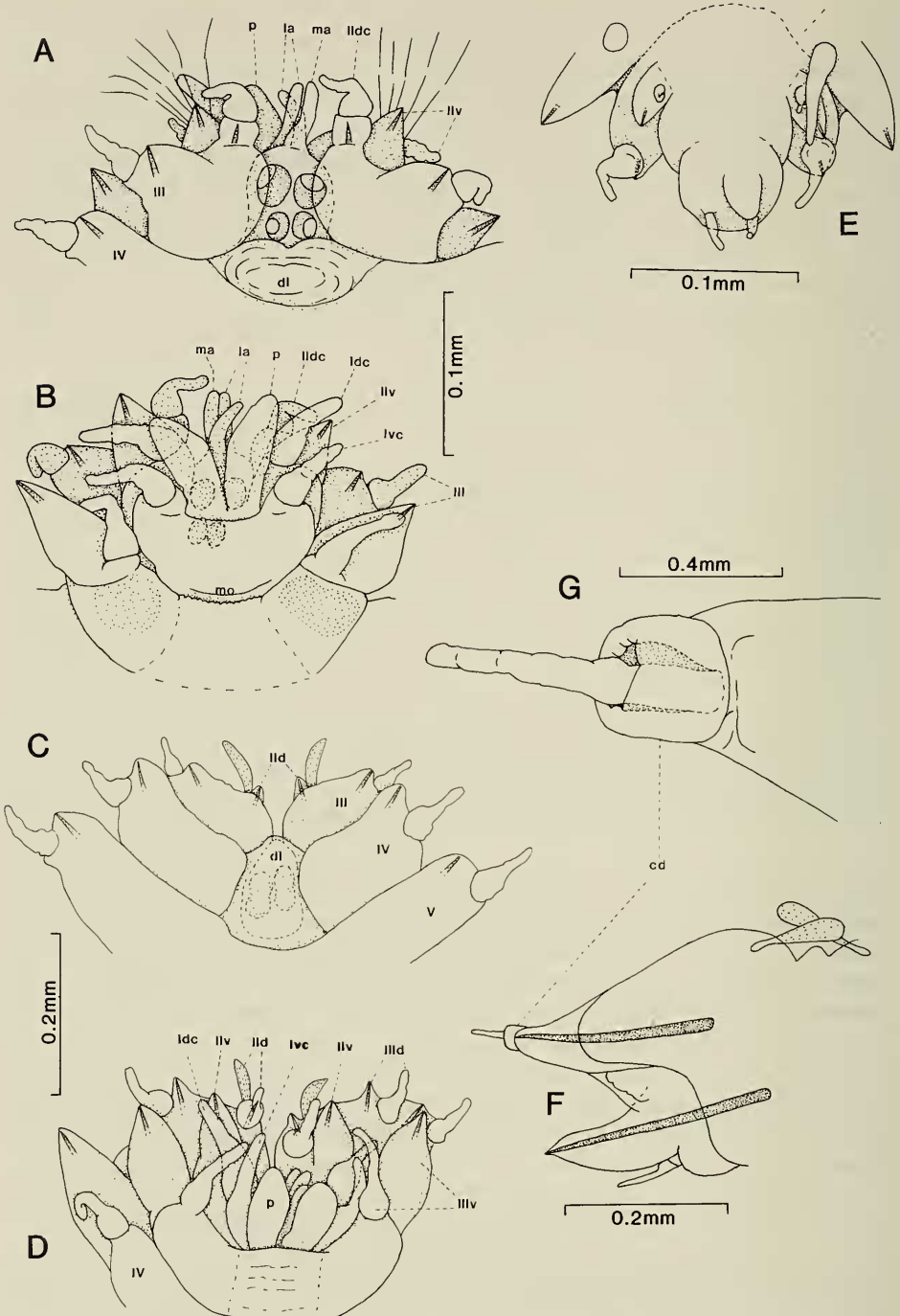


Fig. 23. *Bhawania heteroseta*: A, Anterior end, specimen with prostomium exposed, dorsal view; B, Ventral view of A; C, Same, dorsal view, prostomium covered by dorsal lamella; D, Ventral view of C; E, Pygidium, ventral view; F, Left parapodium, middle segment, anterior view, setae except for small midline paleae omitted; G, Tip of right notopodium, posterior view (A, D, BMNH ZB 1984.63; B, C, FSBC I 31297; E, FSBC I 31308; F, G, FSBC I 31296).

80°13.2'W, 11 m, coarse calcareous sand, 12 specimens (USNM 54226; BMNH ZB 1984.63, 1984.64; IRCZM 50:988, 989; FSBC I 31287–31292).—Same, Sta 4, 27°20.7'N, 80°12.8'W, 11 m, coarse calcareous sand, 2 specimens (FSBC I 31293, 31294).—Same, Sta 5, 27°22.9'N, 80°13.9'W, 11 m, coarse calcareous sand, 12 specimens (USNM 54227; AHF; ZMH P-18228, 18229; FSBC I 31295–31300). FLORIDA (Gulf of Mexico): SOFLA Sta 16, 25°45'42"N, 83°11'04"W, 54 m, 3 specimens (USNM 90636, 90637).—Hourglass Sta I, 4 nmi W of Sanibel Is. Light, 26°24'N, 82°06'W, 6 m, 23 specimens (FSBC I 31318–31321).—Same, Sta J, 24 nmi W of Sanibel Is. Light, 26°24'N, 82°28'W, 18 m, 1 fragment (FSBC I 31322).—Same, Sta K, 51 nmi W of Sanibel Is. Light, 26°24'N, 82°58'W, 37 m, 1 specimen (FSBC I 31322).—Same, Sta L, 73 nmi W of Sanibel Is. Light, 26°24'N, 83°22'W, 55 m, 1 specimen (FSBC I 31324).—Same, Sta A, 4 nmi W of Egmont Key, 27°35'N, 82°50'W, 6 m, 106 specimens (FSBC I 31301–31309).—Same, Sta B, 19 nmi W of Egmont Key, 27°37'N, 83°07'W, 18 m, 3 specimens (FSBC I 31311, 31312).—Same, Sta C, 38 nmi W of Egmont Key, 27°37'N, 83°28'W, 37 m, 3 specimens (FSBC I 31313, 31314).—Same, Sta D, 65 nmi W of Egmont Key, 27°37'N, 83°58'N, 55 m, 4 specimens (FSBC I 31315–31317).—National Marine Fisheries Service, Tampa Bay area estuarine study, 1963–64, upper Tampa Bay, 80 specimens (ZMC; IRCZM 50:699, 50:991; FSBC I 10649, 12107, 12201, 12180, 12213, 12290, 12295, 20646).—Same, Old Tampa Bay, 10 specimens (IRCZM 50:700; FSBC I 10510).—Same, lower Tampa Bay, 166 specimens (YPM; IRCZM 50:698, 50:990; FSBC I 12423, 12635, 12705, 12879, 12977, 13045, 15404).—Same, Terra Ceia Bay, 1 fragment (FSBC I 13466).—Same, Boca Ciega Bay, 5 specimens (FSBC I 12595, 13367, 14552, 14573).—Same, mouth of Tampa Bay, SE tip of Egmont Key, 64 specimens (USNM 97366; MESC 5001-0221; FSBC I 31325; YPM; AHF; IRCZM 50:992).—Off Tampa Bay, Interstate Electronic Corp. Site TB-713, 30 Sep 2–Oct 1979, Sta 3-3, 27°37'06"N, 82°54'06"W, 12 m, 3 + specimens (USNM 97510).—Same, Sta 3-4, 7 specimens (USNM 97511).—Same, Sta 3-7, 8 specimens (USNM 97513).—Same, Sta 3-5, 27°37'12"N, 82°54'06"W, 1 specimen (USNM 97512).—Same, Sta 4-13, 27°37'12"N, 82°55'06"W, 2 specimens (USNM 97514).—Same, Sta 13-8, 27°37'36"N, 82°54'36"W, 13 m, 4 specimens (USNM 97520).—Same, Sta 8-5, 27°38'48"N, 82°55'48"W, 11 m, fragment (USNM 97517).—Same, Sta 8-3, 1 specimen (USNM 97515).—Same, Sta 8-4, 1 specimen (USNM 97516).—Same, Sta 9-7, 27°38'54"N, 82°53'24"W, 9 m, 2 specimens (USNM 97519).—Same, Sta 8-6, 27°38'54"N, 82°55'48"W, 11 m, 1 + specimens (USNM 97518).—NE Gulf of Mexico, EGMEX 70, Sta 22, 28°04'N, 84°41'W, 77 m, R/V *Hernan Cortez*, colls. J. Williams et al., May 1970, 1 specimen (FSBC I 23713).—MAFLA, box core samples, 1977, Transect 3, Sta 16, 28°42'N, 84°20'W, 33 m, coll. N. Blake, 1 fragment (FSBC I 23712).—Same, MAFLA 1975–76 study, Transect 5, Sta 29, Sep 1975, 29°56'N, 86°06'W, 38 m, coarse sand-rubble, 2 specimens (MESC 5001-0220).—Same, Sta 31, Sep 1975, 29°48'N, 86°09.5'W, 45 m, coarse sand-rubble, 1 specimen (FSBC I 31326).—Same, Sta 28, Sep 1975, 29°55'N, 86°05'W, 38 m, coarse sand-rubble, 2 specimens (USNM 97365).—Same, Sta 34, Jan 1976, 29°40'N, 86°17'W, 74 m, coarse sand-rubble, 1 specimen (MESC 5001-0219). TEXAS: STOCS Sta SB3, 27°26'06"N, 96°31'47"W, 82 m, 8 specimens (USNM 90639).—IXTOC Sta S-46, 26°10'00"N, 97°09'48"W, 4.5 m, 3 specimens (USNM 90638). VIRGINIA: York R., Mar 1976, 1 specimen (USNM 56559).—Chesapeake Bay, off Rappahanock R., coll., M. Wass, 1 specimen (USNM 32383).

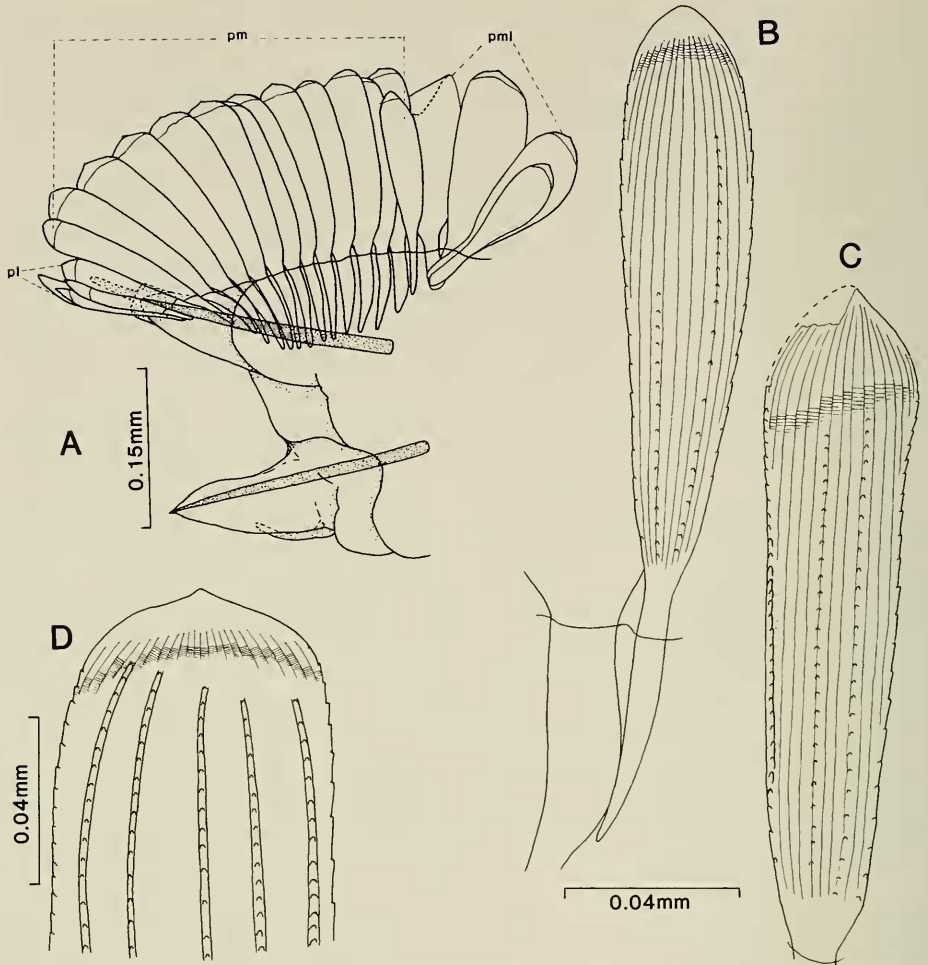


Fig. 24. *Bhawania heteroseta*: A, Left parapodium, anterior view; B–D, Paleae, middle group, showing surface ribs, internal ribs, and distal cross-bars; B, Slender palea near midline paleae; C, Slender palea near lateral paleae; D, Broad middle palea (A, B, FSBC I 31296; C, D, paratype).

*Description.*—Paleae light golden brown, light yellow to pale yellow, iridescent, completely covering dorsum and forming smooth surface on contracted specimens, appearing separated medially on extended specimens. Pigmented glandular areas often present on lower lateral parts of notopodia and on ventrum between neuropodia and longitudinal muscle bands. North Carolina specimens up to 15 mm long, 1 mm wide (Gardiner 1976:100); largest extended specimen examined 12.5 mm long, 0.7 mm wide, 107 segments; most large, sexually mature specimens contracted, 6–8 mm long, 0.7–0.9 mm wide, less than 75 segments; smallest specimens 1.3–1.7 mm long, 0.45–0.5 mm wide, 21–22 segments. Prostomium and first 1 or 2 segments retracted under lamella (dl) at level of segment 4 in about  $\frac{1}{3}$  of specimens, especially large, mature specimens, but palps and antennae usually visible on ventral side (Fig. 23B, C); prostomium almost completely exposed on perhaps  $\frac{1}{3}$  of specimens (Fig. 23A, D); contraction intermediate on

remainder. Median and lateral antennae similar, slender, extending about as far as palps; palps oval, more than twice longer than wide; eyes rounded, anterior pair larger; mouth opening on anterior margin of segment 3 (Fig. 23C, D). Cirri of segments 1 and 2 stouter than antennae, similar to dorsal cirri of segment 3. Notopodia of middle segments (Fig. 24A) each with single long, stout aciculum, 3–4 midline group paleae in longitudinally arranged group, middle group of up to about 15 paleae in long, imbricated, transverse row, and lateral group consisting of 3–5 moderately slender paleae and single broad palea about as wide as lateral palea of middle group. Midline group paleae (Figs. 24A, 25A–C) usually covered by medial paleae of middle group, very thin, broad, slightly asymmetrically tipped, margins gradually curved; large ones with serrate margins and up to 5 serrate midribs, with up to 25 internal ribs, with cross-bars not extending to tip. Medial palea of middle group (Fig. 24A, B) more slender, shorter than others, with blunt tip, pair of serrate surface midribs and serrate margins, 14–16 internal ribs, with cross-bars not extending to tip. Other middle group paleae, except lateral one, all similar (Fig. 24A, B), each thin, broad, almost straight-sided, slightly bent laterally, with slightly pointed tip, about 24 internal ribs, cross-bars extending about to point where margins turn to form tip, pair of lateral and 4–5 similar, narrow, denticulate surface ribs usually ending well short of internal ribs, surface ornamentation of exposed parts reticulate, similar to that on middle group paleae of *B. goodei* but much less distinct. Lateral palea of middle group (Fig. 24A, C) about half as broad as adjacent middle group palea, with pair of serrate midribs and serrate margins, about 16 internal ribs, cross-bars ending well back from tip but extending farther than surface ribs, tip usually frayed, surface ornamentation back from tip similar to that of paleae of middle group, ornamentation similar to that of lateral group paleae near tip. Lateral group paleae consisting of two types, all about same length, shorter than middle group paleae: single one near lateral palea of middle group (Figs. 24A, 25D) pointed, about as broad as lateral palea of middle group, with serrate lateral margins, about 17 internal ribs ending well back from tip, surface ornamentation consisting of irregular knobs; more lateral paleae (Figs. 24A, 25E, F) about 5 (1–5), very thin, less than half as wide, without serrate margins, with 9–10 internal ribs extending for about  $\frac{2}{3}$  of emergent length, indistinct surface ornamentation. Neurosetae described by Gardiner (1976, fig. 5g–i), consisting of spinigers and falcigers similar to those of *B. goodei* but with falcigers less numerous and with blades not as stout; blades with long serrations fragile. Pygidium (Fig. 23E) rounded to bluntly conical, with broad, rounded, midventral lamella (cirrus) and pair of very small lateral or ventrolateral cirri.

*Remarks.*—*Bhawani heteroseta* differs from *B. goodei* in being much smaller, with fewer segments; paleae of the broad middle group are thinner, less numerous, less distinctly but similarly ornamented, with surface ribs all similar and narrow, and with distinct hyaline tips; lateral notosetae are few; and the prostomium is often not retracted within anterior segments (preserved). The prostomium of one specimen of *B. goodei* was found to be almost completely exposed (Fig. 21A, B) and similar to that of many specimens of *B. heteroseta*.

*Bhawania heteroseta* is known in the western Atlantic from Virginia (Wass 1965:15; Dauer et al. 1984:18) to central Florida and the north and central regions of the Gulf of Mexico. The species was reported from the Cape Verde Islands by Rullier (1964:142, 143).



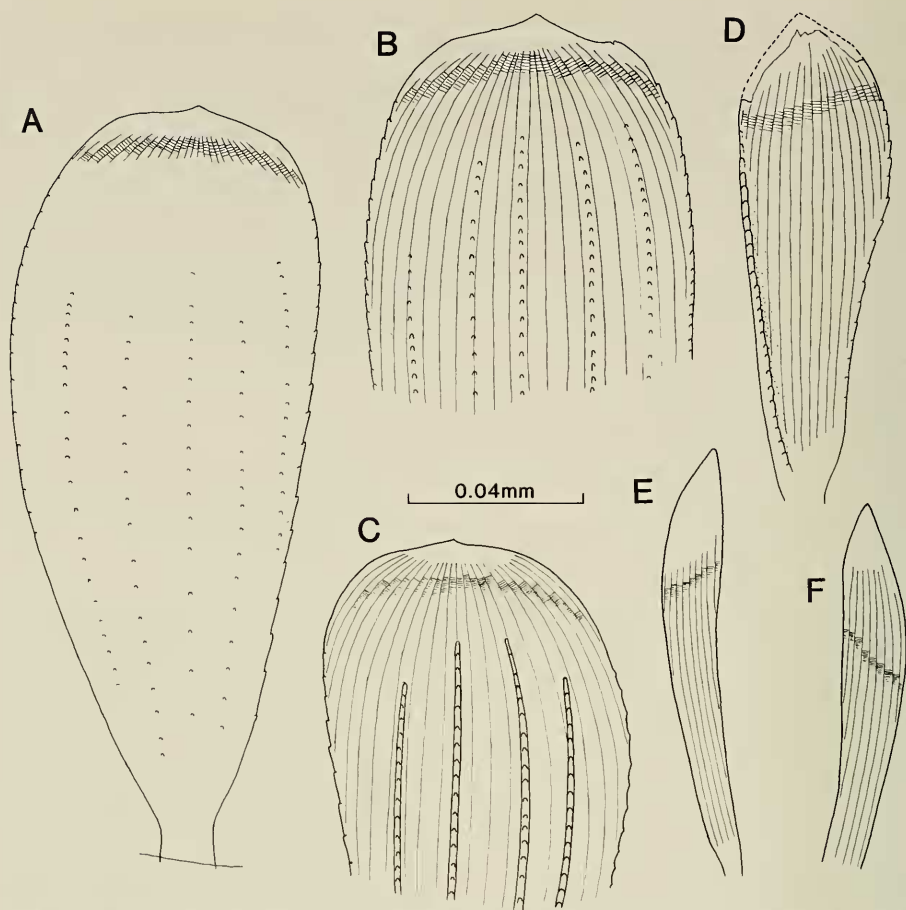


Fig. 25. *Bhawania heteroseta*, paleae of midline and lateral groups, showing surface ribs, internal ribs, and distal cross-bars: A, Second largest palea, midline group; B, Tip of largest palea, midline group; C, Tip of another palea, midline group; D, Broad palea, lateral group; E, F, Slender paleae, lateral group (A–C, F, FSBC I 31296; D, E paratype).

*Bhawania heteroseta* is known from sandy estuarine and offshore areas from shallow water to about 80 m depths; it is not known to inhabit coral reefs or rocky substrates. All of the numerous specimens taken during the Hourglass Cruises were collected by dredge; other collections were made using grabs and dredges, and none of the specimens examined were collected by trawls.

#### *Treptopale*, new genus

*Type-species*.—*Treptopale rudolphi*, n. sp.; gender: feminine.

*Diagnosis*.—Small, slender, more than 50 segments. Prostomium withdrawn, fused laterally with anterior 3 segments; eyes 2 pairs; median antenna originating anteriorly below eyes, cylindrical; caruncle absent; palps spherical; mouth opening on segment 3, without cover; proboscis with small muscular stomach behind stylets (Fig. 26A). Segments 1 and 2 with 3 pairs of dorsal and ventral cirri.

Parapodia biramous, beginning on segment 2, all similar by segment 4; broad notopodial lobes with notopodial paleae in lateral, middle and midline groups; compound neuropodial spinigers on anterior few segments, changing to falcigers on middle and posterior segments; all blades unidentate. Lateral group paleae (pl) few, slender, biserrate with symmetrical tips. Midline group paleae (pml) few, in longitudinal row, bent medially, moderately broad, biserrate, with more or less symmetrical tips. Middle group paleae (pm) completely covering dorsum, extending in fan-shaped bundle from single developmental center, occupying about half of total width of dorsum, forming curved single, imbricated row; paleae broad, paddle-shaped, with symmetrical, short, pointed tips near middle of distal end, about 20 internal ribs. Pygidium not observed.

*Remarks.*—*Treptopale* differs from *Paleanotus* Schmarida in having paleae of the middle group with symmetrical tips. The mouth of *Treptopale* opens on the second apparent ventral segment behind the palps, whereas the mouth opening on *Paleanotus* is on the first apparent ventral segment. This suggests a difference in the proboscis which I cannot confirm. Finally, the possibly immature specimen of *Treptopale* available has more than 50 segments; *Paleanotus* is reported to have about 40 segments.

Both *Paleanotus* and *Treptopale* have paleae of the middle group formed in single bundles. However, those of *Paleanotus* (Fig. 1B) have asymmetrical tips resembling tips of paleae of a lateral bundle of *Chrysopetalum* (Fig. 1A), and it is suggested that *Paleanotus* is descended from a *Chrysopetalum*-like ancestor by a loss of all but one of the lateral bundles of paleae, loss of one pair of ventral cirri, and a broadening of the reduced numbers of paleae so that they cover the dorsum. *Treptopale* can be derived from a *Chrysopetalum*-like ancestor by a similar process. However, it is suggested that *Treptopale* has evolved through loss of all but one middle paleal bundle of each notopodium.

*Etymology.*—The generic name is derived from a combination of the Greek, *treptos*, changed, and *-pale*, the second element of the name of *Heteropale* Johnson, 1897 (= *Paleanotus*), and refers to the principal difference between *Treptopale* and *Paleanotus* Schmarida.

*Treptopale rudolphi*, new species

Figs. 26, 27

*Material examined.*—FLORIDA (Atlantic): Dade County, S. Biscayne Bay, DERM Sta 16, Ragged Keys, near channel between 2 keys, 25°32'01"N, 80°10'17"W, 2–3 m, scoured hard bottom, holotype (USNM 97370).

*Description.*—Holotype coiled, 5–5.5 mm long, 0.5 mm wide, 60 segments; anterior and middle parts of body similar in width after first few segments, tapered near posterior end. Prostomium (Fig. 26A–C) with posterior eyes dorsal, partly covered by segment 2; anterior eyes larger, not visible from dorsum, apparently on anterior margin above median antenna, directed anterolaterally; palps originating anteroventrally below lateral antennae. Dorsal cirri of segment 1 about in line with median antenna, below dorsal cirri of segment 2; ventral cirri of segment 1 originating lateral to palps; all similar to dorsal cirri of following segments. Notosetae of segment 2 consisting of about 4 short, slender paleae on each side; segment 3 with only middle group paleae; midline and lateral groups of paleae

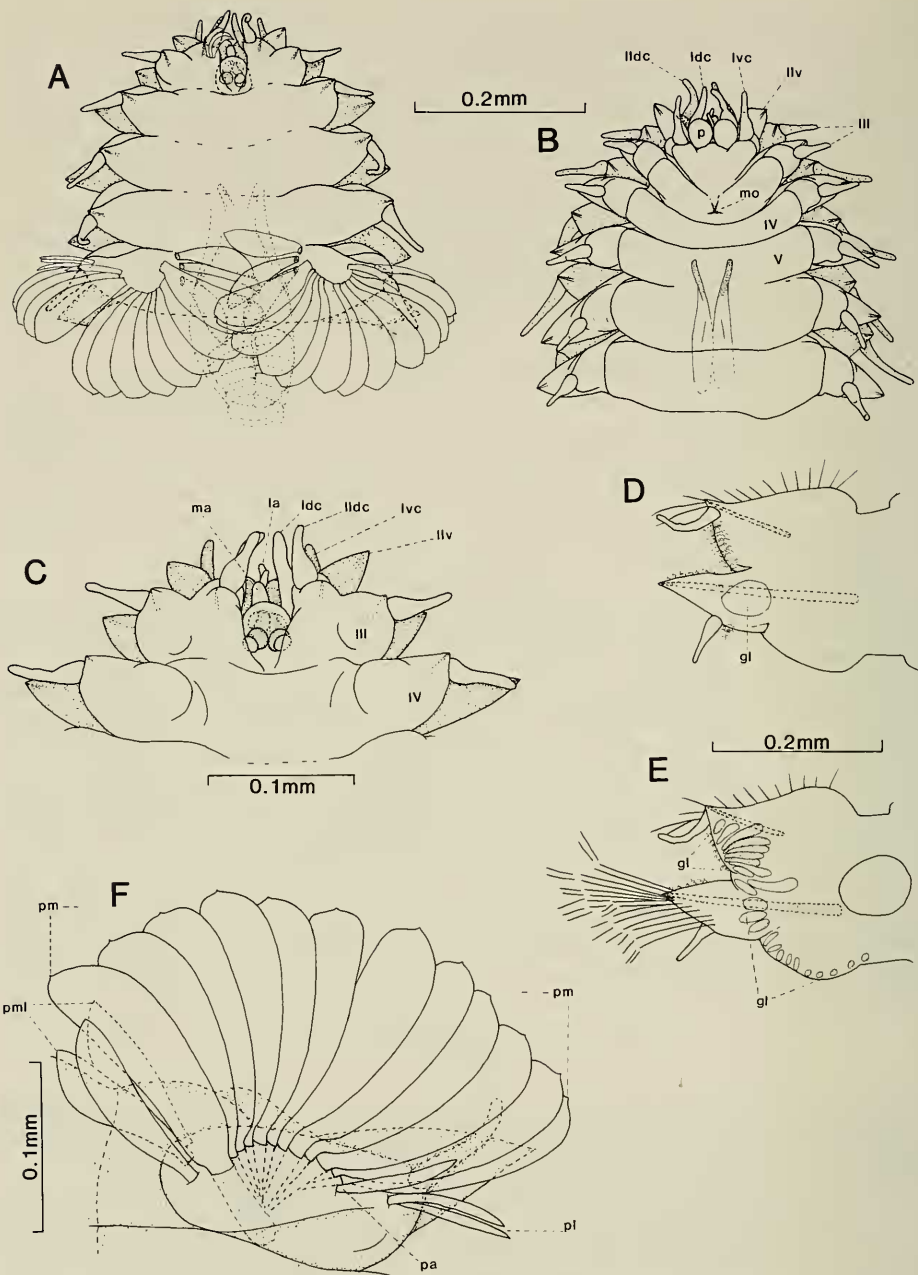


Fig. 26. *Treptopale rudolphi*, holotype: A, Anterior end, dorsal view; B, Same, ventral view; C, Same, dorsal view, enlarged; D, Right parapodium, middle segment, posterior view; E, Left parapodium, middle segment, anterior view; F, Right notopodium, middle segment, dorsal view.

beginning on segment 4. Notopodia of middle segments (Fig. 26D, E) with 1, occasionally 2, relatively short, slender acicula, extending into tip; glands containing opaque granules (Fig. 26E) beginning on anterior side below notopodial aciculum, continuing to near ventral nerve cord, gradually diminishing; dorsal

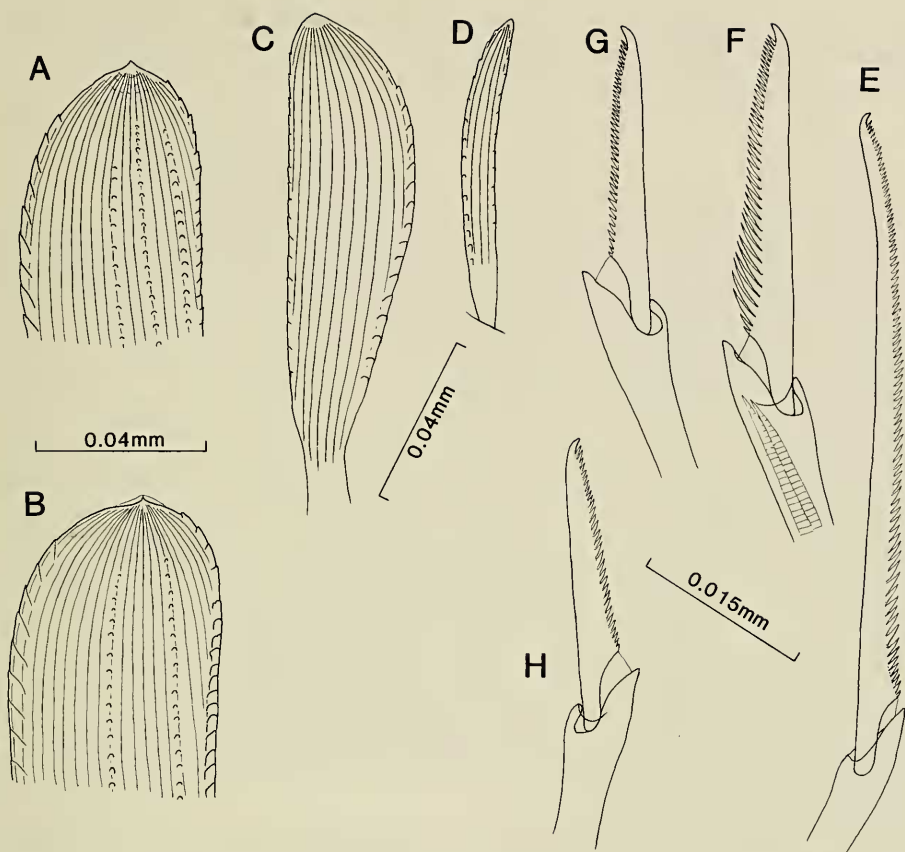


Fig. 27. *Treptopale rudolphi*, setae of middle segments, holotype: A, B, Paleae, middle group, left notopodium; C, Palea, midline group; D, Slender anterior group palea, near lateral palea of middle group; E, Upper compound falciger; F, Middle compound falciger; G, Same, with short serrations; H, Lower compound falciger.

cirri moderately long, slender, tapered. Neuropodia of middle segments with indistinct postsetal lobe, ventral cirrus with stout base and slender tip; rounded, internal "cavity" containing clear substance, perhaps oil, visible on posterior side of neuropodia (Fig. 26D, g1). Lateral group paleae of middle notopodia (Fig. 26F) 2–3, slender, about  $\frac{1}{2}$  length of middle group paleae, serrate on both margins, extending laterally from body anterior to tip of notoaciculum, with about 5 internal ribs. Midline group paleae (Figs. 26F, 27C) 3, all similar, serrate on both margins, shorter than middle group paleae, with about 15 internal ribs. Single anterior group palea (Figs. 26F, 27D) anterior to lateral middle group palea; similar to lateral group paleae. Paleae of broad middle group about 13 (Figs. 26F, 27A, B), all similar, fragile, with hooded tips, equally serrate on both margins, with marginal serrations very broad, with 2 or 3 rows of smaller serrations near medial margins extending to near tips and few more rows ending proximally. Compound falcigers of middle segments (Fig. 27E–H) about 20; blades longer above, gradually shorter below; several blades in middle of bundles with long serrations. Interramal region ciliate (Fig. 26D, E).



*Etymology.*—The species is named in honor of Harvey D. Rudolph, Florida Department of Environmental Regulation, who has provided me with many very interesting specimens from southern Florida.

*Hyalopale*, new genus

*Type-species.*—*Hyalopale bispinosa*, n. sp.; gender: feminine.

*Diagnosis.*—Body relatively short, about 20 segments. Prostomium withdrawn, fused laterally with anterior 3 segments; eyes 2 pairs; antennae filiform, median antenna originating below eyes; caruncle absent; palps cushion-shaped; mouth opening at posterior margin of first apparent segment behind palps and bisecting segment 3, possibly with small cover extending from segment 4; muscular stomach behind stylets large. Segments 1 and 2 with 3 pairs of dorsal and ventral cirri, with ventral cirri absent from segment 2. Parapodia biramous, beginning on segment 2, all similar by segment 4, each with broad notopodial lobe, only middle group paleae, serrate spines beginning on notopodia of segment 4 near lateral and medial margins of paleae; interramal region ciliate. Compound neuropodial spinigers on anterior few segments, changing to falcigers on middle and posterior segments, all with unidentate blades. Paleae broad, thin, clear, not completely covering dorsum of middle segments, in fan-shaped bundle from single developmental center, occupying  $\frac{1}{3}$ – $\frac{1}{2}$  segmental width, forming curved, imbricated row; paleae asymmetrical, similarly oriented, machete-shaped, with short, pointed tips near medial margin, medial margin concave, smooth, partially covered by adjacent paleae, lateral margin exposed, convex, serrate, more than 25 internal ribs; newly forming paleae produced at lateral margin above aciculum. Pygidium small, rounded, with pair of anal cirri.

*Remarks.*—*Hyalopale* differs from *Paleanotus* Schmarda in lacking paleae in lateral and midline groups and in having very thin, clear paleae in the broad middle group with about 25 internal ribs. Lateral and midline group paleae of *Paleanotus* are replaced by spines in *Hyalopale*, and middle group paleae of *Paleanotus* are thicker and have between 15 and 20 internal ribs. The position of the mouth of *Hyalopale* may also differ from that of *Paleanotus*, and antennae of *Hyalopale* are all similar, whereas the median antenna is cylindrical and lateral antennae are cirriform on all specimens of *Paleanotus* that I have examined. The muscular stomachs of *Paleanotus* and *Hyalopale* may differ. The stomach of *Hyalopale*, resembling the proventriculus of Syllidae (Fig. 28B, see Perkins 1980), is much larger than that of any *Paleanotus* that I have observed.

*Etymology.*—The generic name is derived from a combination of the Greek, *hyalos*, glass, and *-pale*, the second element of the name *Heteropale* Johnson, 1897 (= *Paleanotus*), and refers to the clear paleae.

*Hyalopale bispinosa*, new species

Figs. 28, 29

*Material examined.*—FLORIDA (Atlantic): S Biscayne Bay, DERM Sta 16, Ragged Keys, near channel between 2 keys, 25°32'01"N, 80°10'17"W, 2–3 m, scoured hard bottom, holotype (USNM 97367), paratype (USNM 97368), 2 specimens (DERM).—About 2 mi E of Florida Power and Light Co. Turkey Point power plant, at end of power plant channel, 2.5 m, colls. DER personnel, 15 Feb

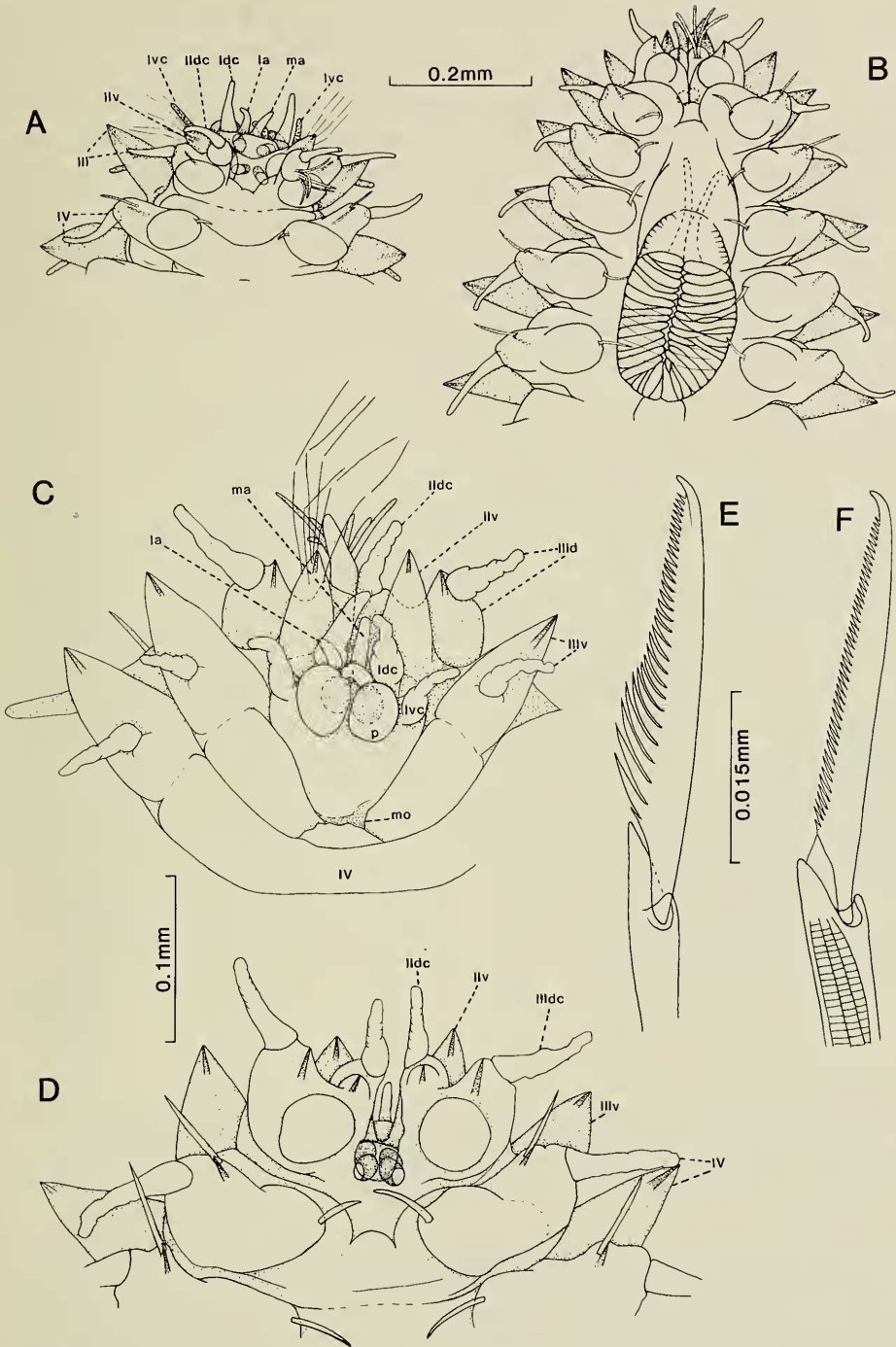


Fig. 28. *Hyalopale bispinosa*: A, Anterior end, dorsal view of specimen with prostomium partly exposed; B, Same, prostomium covered by anterior segments; C, Anterior end, ventral view of B; D, Same, dorsal view, prostomium partly exposed; E, Middle compound falciger; F, Lower compound falciger (A, holotype; B-F, FSBC I 31383-USNM 97369).

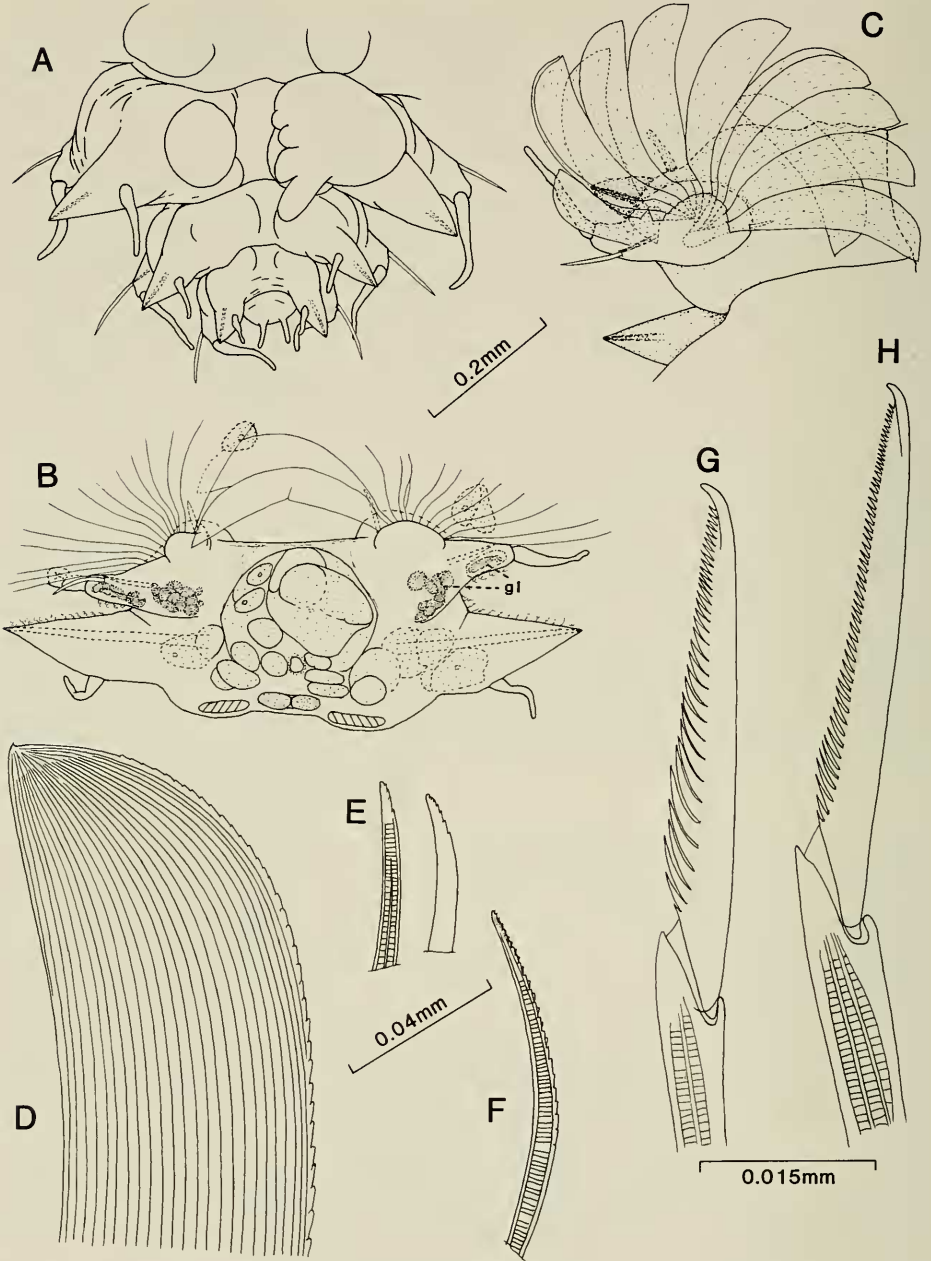


Fig. 29. *Hyalopale bispinosa*: A, Posterior end, ventral view; B, Middle segment, anterior view; C, Left parapodium, middle segment, dorsal view; D, Middle group palea, right parapodium, middle segment, showing internal ribs and serrated lateral margin; E, Spines, midline group, one showing internal structure; F, Spine, lateral group, showing internal structure; G, Middle compound falciger; H, Upper compound falciger (A, holotype; B, DERM Collection; C, USNM 97368; D-H, FSBC I 31383-USNM 97369).

1978, 2 paratypes (USNM 97369; FSBC I 31383).—Florida Keys (Monroe County): Looe Key National Marine Sanctuary, reef crest, coralline covered rubble, less than 1 m, Sta FLK-4, 2 young specimens (USNM 97530).

*Description.*—Holotype, largest complete specimen, 2.8 mm long, 0.7 mm wide, 20 segments; other complete specimen (USNM 97369), also 20 segments; mature female present (Fig. 29B; DERM). Prostomium (Fig. 28A–D) with antennae much smaller than dorsal cirri of segments 1 and 2; anterior eyes directed anteriorly or anterolaterally, on shelf below neuropodia of segment 2, above notopodia of segment 1; posterior eyes directed dorsally or anterodorsally, on shelf below notopodia of segment 2; slightly smaller than anterior eyes. Dorsal cirri of segment 1 attached near level of median antenna, above lateral antennae, similar to dorsal cirri of segment 2; ventral cirri of segment 1 attached lateral to palps, smaller. Notosetae of segment 2 consisting of inverted cone of about 6 spines (Fig. 28B); notosetae of segment 3 only middle group paleae; notosetae of segment 4 and following segments middle group paleae, lateral and midline group spines. Notopodia of middle segments each with aciculum ending well back from tip of moderately long dorsal cirrophore; glands containing opaque granules in cirrophore below aciculum and more proximally (Fig. 29B); dorsal cirrus relatively long, slender. Neuropodia of middle segments with indistinct postsetal lobe, short, slender, ventral cirrus below setae, without apparent neuropodial gland. Lateral and midline group notopodial spines (Fig. 29E, F) usually single, occasionally 2, biserrate; lateral group spine curved, originating anterior to aciculum, directed laterally, usually twice as long as midline group spine; midline group spine originating posteromedial to medial palea of middle group, directed dorsomedially. Middle group paleae of middle segments (Fig. 29C, D) about 13, fragile, easily broken, unornamented except for exposed, convex, serrate, lateral margins, with hooded tips. Compound falcigers of middle segments (Figs. 28E, F, 29G, H) numerous, more than 30, blades longer above, gradually shorter below; several blades in middle of bundles with very long serrations. Anal cirri filiform, originating slightly ventrally (Fig. 29A).

*Etymology.*—The specific name is derived from the Latin prefix *bi*, two, and *spinosa*, thorny, and refers to the two groups of spines on notopodia of middle segments.

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